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Determining Cost-effectiveness and Learning Impact of Government-funded Counterterrorism Training Programs

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This is to certify that the doctoral dissertation by

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Doctor of Philosophy

Public Policy and Public Administration

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Abstract

Since September 11, 2001, money and resources have been allocated at unprecedented levels in order to prevent future attacks on the United States. In the interest of preventing a similar type of incident, counterterrorism initiatives were funded using public funds with little or no oversight as to measuring the effectiveness of these programs. The purpose of this quantitative study was to determine if there was a statistically significant difference in the dependent variable – the level of awareness of participants (the ability to identify terrorism threats) who attended counterterrorism training that was solely lecture based and one that combined both lecture and demonstration. Three theoretical frameworks provided the foundation for this study: The organizational knowledge creation theory, adult learning theory and the experiential learning theory. The Solomon four-group design was employed using 412 test subjects who attended the Federal Bureau of Investigation's National Improvised Explosives Familiarization/Chemical Industry Outreach Workshop . The results of a factorial ANOVA revealed no statistically significant difference in posttest scores between the inexpensive lecture and the more expensive lecture and demonstrations methodologies; however, the results from the paired *t* test with a $p < .001$ did demonstrate cost-effectiveness with an average increase of 14 points in the level of awareness from pre- to posttest. The positive social change implications stemming from this study include recommendations to identify objective measures for program effectiveness in all government programs in compliance with the Administrative Procedures Act of 1981. If followed such actions would demonstrate good governance and are likely to increase the public's trust.

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Dedication

I would like to dedicate this work to my daughter Brittney N. Jones and her son, Rory A. Jones, and my daughter Haley A. Jones who sacrificed much during this study. I would additionally like to dedicate this to the memory of my parents, Ira D. Jones, Sr. and Joyce H. Jones, who's memories help to drive me through this process. Lastly, I would like to say a very special thank you and specifically dedicate this work to my wife, Angela L. Jones, without her love and support and her willingness to travel with me to complete this study I would not have been able to do so. I love you all and thank you.

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Chapter 1: Introduction to the Study

Introduction

In the present economic conditions, public administrators are forced to scrutinize expenditures at every level and in every facet of governmental spending. The difficulties that administrators face is in finding the balance in meeting mission requirements and staying within the fiscal restrictions provided. This in itself seems to be a logical approach that, to an outsider, may appear to be easy to accomplish. The truth is this concept is easier to achieve in theory but in practice is a far more daunting task for administrators to achieve.

The difficulty lies in determining which programs are providing the government the best return on investment. If a program is functioning in an efficient and effective manner, then the program's budget should remain largely intact. However, if a program is underproducing or not producing the desired return on investment, those programs should receive further scrutiny and it should be considered whether redesigning the program, reducing the funding and functions of the program, or eliminating the program altogether and redistributing funding to productive ventures or to new ventures that lack adequate funding are the best options.

This study serves as an example of how to measure a government program for effectiveness by studying one specific program. The program that I studied served as a "type" to demonstrate that all government programs can and should be measured for effectiveness to either justify the expenditure or to identify its short comings. I focused on the United States Government's counterterrorism programs. More specifically, I

looked at counterterrorism prevention and preparedness training. The training program that I selected was the Federal Bureau of Investigation's (FBI) National Improvised Explosives Familiarization (NIEF) course/Chemical Industry Outreach Workshop (CIOW; Federal Bureau of Investigation, 2015b; 2015f; 2014b) as noted above that served as a "type" and that demonstrated that courses can and should be measured for effectiveness.

While this study was public policy-based, it crossed over a couple of academic disciplines. The reason being was, when dealing with program areas such as training, a policy-based decision is incomplete without considering the supporting educational theories that served as the basis for determining the effectiveness of the training evolution. The next section includes the background for this study.

Background

The terrorist attacks on September 11, 2001 caused the United States government to institute policy changes that affected the lives of citizens and visitors to United States (Mueller & Stewart, 2011). Americans were ill-prepared to address such threats to the United States. Never have there been such sweeping changes to United States as the changes that were instituted following the terror attacks. The United States was in shock and something had to be done to address the new threat and the future threats the country was likely to face (Kemp, 2012). In response to the attacks on 9/11, the Department of Homeland Security (DHS) was created in order to prepare for and prevent against future attacks (Kemp, 2012; Mueller & Stewart, 2011) . The United States began a war in Afghanistan and, a short time later, in Iraq as well. For the first time, first responders,

public institutions, private corporations, and every citizen had a role in guarding this nation against the next inevitable attack by being vigilant in recognizing indicators for terrorist activities and to have a willingness to report those concerns (Kemp, 2012).

Among the new trends in homeland security was the federal government's new emphasis on protecting the nation from within its borders. The new emphasis was profitable to some federal, state, and local agencies and taxing to others (Hart & Ramsay, 2011). New protective and training measures were instituted and were provided significant federal funding to support these initiatives flowed nearly unabridged in any fashion (Hart & Ramsay, 2011; Kemp, 2012; Mueller & Stewart, 2011). Grant money flowed from the federal government to state and local governments in the form of grants to help fund those agencies that would not otherwise have had the financial wherewithal to meet the new challenges (Mueller & Stewart, 2011).

While many federal, state and local agencies benefited from these new initiatives through training and equipment through new federal funding streams these efforts themselves were not without their detractors (Mueller & Stewart, 2011). In the haste to fund these agencies, as stop-gap measures, administrators overlooked the need to be responsible with funding and to track where the money was going and whether or not the spending provided the desired results. Now, more than 15 years later the funds are disappearing and public administrators have come to realize with the funding streams drying up that they must be judicious in their allocations to fund programs.

Problem Statement

The events of 9/11 changed the United States' government's perspective concerning terrorism. As a direct result of the attacks, the federal government set forth to ensure that another 9/11 never happens again by instituting a number of initiatives, one of which is prevention and preparedness training primarily for first responders and security personnel from critical infrastructures (Turner, Glantz, & Gall, 2013). In the first 10 years following 9/11, the United States government saw an increase in homeland security spending by more than one trillion in security measures and training initiatives (Mueller & Stewart, 2011).

As noted above, a great deal of money has been spent to prevent acts of terrorism or prepare against future acts of terrorism, including various types of counterterrorism awareness training initiatives. These expenditures are a result of fear and trepidation that another 9/11 is looming and all citizens must be prepared to prevent or minimize the impact of such threats (Mueller & Stewart, 2011).

As a result of this fear, government funds have been expended on various training initiatives with little to no attention given to their effectiveness, or whether the financial outlay provides a reasonable return on the government's investment (Mueller & Stewart, 2011). How then can the worth of the training be determined? This in itself is not an easy to answer and cannot be adequately addressed from a public policy perspective alone without first examining the training from an educational vantage point.

The most common instructional method in counterterrorism training is lecture; however, lecture alone often makes it difficult for participants to retain the key learning

points. Without combining lecture with a secondary approach, such as participation in a table top exercise that allows the participants to actively engage in the learning process, it is insufficient (Jackson, 2011). In normal lecture format, only verbal and auditory learners can connect with the training; however, by adding the table-top or other interactive instructional methodologies, kinesthetic learners have the opportunity to learn (Jackson, 2011). Within the field of adult education it is a commonly held belief that adult learners learn best when engaging multiple human senses (Arms, 2012; Bohonos, 2014; Cantor, 2001; Federal Bureau of Investigation, 2009; Feemster, 2010). What is lacking, and where there is a gap in research literature is silent is in evaluating the link between instructional methodologies in counterterrorism training and determining which if either methodology provides a greater level of awareness and thus a great return on the government's investment.

The rationale behind my selection of explosive awareness as a counterterrorism program to study was that, since 1970, there have been over 141,966 terrorism related attacks worldwide and of those acts of terrorism, 68,074 used bombs or some sort of explosive material. Explosives were used in 48% of all terrorist acts worldwide (Global Terrorsim Database, 2015). By accounting for nearly 50% of the terrorists acts it is easy to believe that this sort of training is the government's top priority. While it is a priority, it has been slow to become formalized (National Bomb Squad Commanders' Advisory Board, 2016). It is argued by the National Bomb Squad Commanders' Advisory Board (NBSCAB) that not only would first responders benefit from this type of training but security personnel, private sector retailers and private and public policy makers as well (National Bomb Squad Commanders' Advisory Board, 2016).

Research Question

The research questions that I addressed in this study are the following:

1. Is there a statistically significant difference in adult learning that takes place between counterterrorism awareness training that is lecture based only compared to counterterrorism awareness training that involves both lecture and a demonstration?

2. Is there a correlation between instructional methodologies used in counterterrorism training and the government's return on investment?

Hypotheses

H_0: There is no statistically significant different in counterterrorism awareness of adult learners in the lecture only method compared to the lecture and demonstration method.

H_1 There is a statistically significant difference in counterterrorism awareness of adult learners between the lecture only and the lecture and demonstration approach.

Variables

Independent – The introduction of an explosive demonstration following classroom lecture

Dependent – Participants' level of awareness (increased knowledge)

Controlling – First responders (police, fire, and EMS), private/public security, and industry leaders

Nature of the Study

Quantitative

I chose a qualitative study design to determine if there was a statistically significant difference between counterterrorism awareness training that is solely lecture based compared to training that consists of both lecture and a demonstration which helped to identify the cost effectiveness of such approaches. I selected a quantitative research design because I was trying to determine if a causational relationship existed between the type of training offered and how well information was retained, in other words, did "A cause an outcome in B" (Moutinho & Hutcheson, 2011, p. 12).

In this study, I used a classical experimental design, which meant that experimental control was maintained and participants were randomly assigned to their testing groups (Moutinho & Hutcheson, 2011). In an experimental design, there must be at least two groups, in which one receives a treatment or a condition and the other does not, as a means of comparison for a causal relationship (Moutinho & Hutcheson, 2011). The method by which I selected the participants was a tenuous one. The challenge came in trying to identify how to capture the appropriate target audience. The target audience was first responders (police, fire, EMS), both private and public security, industry leaders and other parties that may directly or indirectly be faced with various aspects of terrorism.

The FBI has a program that has been a major source of outreach for the organization and has been on a successful run for a number of years. The course comes in several different formats. The first known as the 3-day National Improvised Explosive

Familiarization (NIEF) is primarily for certified public safety bomb technicians, who were not the target participants for this study (Federal Bureau of Investigation, 2015f). The reason this group was excluded is because of their background; they should score significantly higher than the other above-mentioned groups and would serve as outliers with unusually higher scores. The other two methods referred as either the 1-day NIEF or the Chemical Industry Outreach Workshops (CIOW) (Federal Bureau of Investigation, 2015b). he only difference between the two is that the 1-day NIEF would provide the lecture portion to the target audience, while the excluded population was creating the explosives to be used in the demonstration to complete their learning. At the end of the day, the target audience would then watch the explosive demonstration that the other group had prepared. The CIOW is only slightly different, in that the target audience receives the same lecture as the 1-day NIEF, the only difference was that there was not a separate group learning to make the explosive mixtures during the lecture. The explosive demonstration was the same; the only difference was that experienced technicians were setting up the demonstration while the lecture was taking place. The target audiences were not aware of the difference and that is why the latter two courses were used interchangeably for testing locations.

The invitations to participate in the training were initiated through the FBI Weapons of Mass Destruction (WMD) coordinator, who either mailed or emailed invitations to the sheriff, chief of police, industry executives, or the agency's/corporate training coordinator inviting them or their personnel from their agency/corporation to attend the explosive awareness training. The WMD coordinators (WMDC) required the

recipients to R.S.V.P. so that they could be assured that the attendees were the appropriate target groups for their outreach.

The participant demographic I selected for this study mirrored that for the FBI's outreach and is the reason why I selected this program. The R.S.V.P. allowed the WMDC the opportunity to ensure that adequate space and amenities were available and ensured that I had sufficient testing materials present.

Upon the arrival of the attendees, an FBI representative who would check them in to the training greeted them. I would then approach each potential participant and introduce myself and explain that I was a doctoral student conducting research. I would then ask them if I could read them the informed consent and if they agreed I would read the informed consent. After reading the informed consent, I would then ask for their willingness to participate and emphasized that, regardless of their answer, they would be allowed to attend the training. If they agreed we executed the informed consent and I had them draw a card from a box. The letter on the card designated their group assignment. Those who opted-out were thanked for their consideration and were invited to find their seats before the training began. In consulting with WMDCs before my research began, I determined that the best course of action was not to inform the potential participants in advance that there would be a study being conducted in conjunction with the training. I made this decision for several reasons.

The first reason was that most people do not fully read the invitations and they might have misinterpreted the fact that they had an option to or not to participate. The WMDCs thought that it would be better if potential participants were asked in person, so that it could be made clear that their attendance to the class was not contingent on their

participation in the study. The second reason is that often the invitation does not always filter to the actual attendee so the attendee may have no knowledge of the study in advance of their arrival. The final reason is that many times there are last minute replacements and we wanted to ensure that each attendee received the same information.

As noted earlier, those who opted in drew a card from a box. The cards were folded and contained an A, B, C or, D representing each of the four groups. Group A participants were asked to take a pretest and then a posttest after both the lecture and the explosive demonstration. Group B participants were asked to take a pretest and a posttest after the lecture portion but before attending the explosive demonstration. Group C participants were asked to take a posttest after both the lecture and the explosive demonstration. Group D participants were asked to take a posttest after the lecture but before attending the explosive demonstration. Groups A and C served as my experimental groups and Groups B and D served as my control groups. Having the participants drawing from a box ensured that they had an equal opportunity to be assigned to any of the four groups and ensure that my sample was, in fact, a random sample.

Lastly, those who opted out were a non-testing group, no pressure was applied and they were allowed to freely attend the training without participation in the study, thus ensuring that participation was truly voluntary. This aspect was of importance for two reasons. The first was to protect the integrity of the study itself and the second was to ensure that the FBI's outreach mission would not be negatively affected. The only excluded group, who was excluded from the study automatically, was currently certified bomb technicians. Bomb technicians were allowed to attend the training but were not

allowed to participate in the study because they would have skewed the testing results by artificially raising the median score, in that, the material should be common knowledge to this group.

Method

The Solomon four-group design (Frankfort-Nachmias & Nachmias, 2008) served as the design of choice for conducting my research. My rational in using the Solomon four-group design that the design is among the most rigorous of any of the designs in use (McGahee & Tingen, 2009). This design ensured that the pretest did not influence the results of the posttest by sensitizing the participants as to what to look for in the posttest. What I was hoping to accomplish through the test was to determine if there was a measurable difference between lecture only and a combined lecture and demonstration approach. As stated earlier, the Solomon ensured that the pretest was not influencing the posttest. The two control groups took the posttest immediately following the lecture, or in absence of the treatment (demonstration). The two experimental groups took the posttest immediately following the treatment (demonstration).

The research question itself drives the methodology, which in this case was a quantitative approach, but could also have been a qualitative or a mixed-method approach. My rationale for not using a qualitative or mixed method approach was because for this study, I was simply looking for a yes or no answer regarding whether or not there was a statistically significant difference in training approaches. The reason that I opted for the simple yes/no that quantitative research provides was because, in addition to sharing the results with the academic community, I specifically wanted to be able to

present the data to federal executives. Federal executives often have little time to consider participants perceptions or attitudes toward training and they want to know the bottom-line of whether the training is effective. If a training program is found to be effective, they often choose to leave the program alone. When the training is found to be ineffective, the executives are highly likely to either revamp the training to become more effective or eliminate the training as an unnecessary expenditure of government funds.

While these are not sufficient reasons for selecting the approach, it was an added benefit. By demonstrating that the program was able to be measured quantitatively I was able communicate with public policy executives in a lexicon that they understood, which is statistics. However, I would like to conduct future research by conducting a qualitative study on the perception of the learners to discover if they enjoyed the training and if they feel that they have learned more and why.

Participants

The participants for this study were a combination of three groups: First responders, public and private security personnel from chemical industry (CI) and industry executives, which included executives from CI as well as other commercial industries such as Home Depot, Sally's Beauty Supply, and similar industries (Federal Bureau of Investigation, 2015b; Federal Bureau of Investigation, 2015f). The reason for having selected first responders that included police and fire and EMS personnel was because this population is the most likely to encounter these explosives either assembled in a pre-blast form or a post-blast form. The private or public security included security personnel of such government locations such as the Strategic Petroleum Reserve (SPR) or

private security for companies like DOW chemical or Archer, Daniels, and Midland (ADM). This group was important because they may encounter these threats as part of their security duties and need to know and understand the associated risks. The final group was important because they need to know and understand why it is important for them to track sales within their corporations such as Sally's, for example, who sells high grade hydrogen peroxide. Tracking hydrogen peroxide, which often serves as a chemical precursor in the production of improvised explosives, could produce an intelligence lead that may prevent an act of terrorism.

Additionally, as chemical and commercial industry executives gain greater insight into how chemicals from their plants may be used in the production of explosives, this added insight may lead to greater security measures taken at their facilities, which in turn may make it more difficult for would-be terrorists to gain access to these chemicals. I conducted a G*Power analysis which identified that I would need to collect testing data from at least 385 participants.

Access to Information

The one advantage I had over other researchers was that I had the necessary access to conduct research of the FBI's NIEF/CIOW program because I am an employee connected with the program; however, my role was solely as a researcher. I obtained permission be from the FBI in the form of the FBI's own Institutional Review Board (IRB) and authorization from the Deputy Assistant Director of the Critical Incident Response Group. Although I am an employee, I do not believe a potential conflict existed, because I had no personal stake in the results. For me and the FBI, regardless of

outcome the results were valuable for the FBI. If my results determined that the training did make a measurable difference, then the FBI was spending tax dollars wisely. If my results indicated that the training did not make a measurable difference, then the FBI had the opportunity to rework, redesign, or eliminate the program. Regardless of what the results were, the FBI has been able to demonstrate to the public that the organization was and is attempting to be a wise steward of tax-payer dollars.

I wanted to ensure that I did not interfere with the testing or add my own personal bias, so I made sure in advance that FBI employees responsible for coordinating the various training venue locations understood that my role was that of a researcher and that I would not be teaching or assisting with any of the training beyond those areas specific to the study. I had the FBI Weapons of Mass Destruction Coordinators (WMDC) make the initial contacts with potential participants as is a normal part of their jobs. Upon the arrival of the participants, I engaged the potential participants and ask them if they would allow me to read the informed consent and then would solicit their participation in the study. For those who opted in to the study, I would then ask them to draw a card from a container that I had. Inside the container contained folded pieces of paper with either the letters A, B, C or D on the inside of the fold. When a participant selected a piece of paper, we would look at the letter and that letter then served as that participant's group assignment. For those who opted out of the study, I thanked them for their time and they were allowed to attend the training without any undue pressure added.

As previously noted, I did not teach at any of the training sessions in order to ensure that I did not unduly influence the participants. Another key point to the study was that I took measures to ensure that Special Agent Bomb Technicians (SABTs) who would

be teaching at the sessions were prohibited from seeing the pretest or posttests. I made this decision so that I was sure that the SABTs were not influenced to teach to the tests.

Possible Types and Sources of Information or Data

The sources of information for this study came from the pretest and posttest scores. I compared the mean score between the control and the experimental groups. However, for future research I included a biographical inventory that includes information regarding gender, race, age, level of education, and occupation group (police, firefighter, EMS, security personnel, industry executives) attached at the end of the posttests. Gaining this additional information will allow me or other researchers to conduct future research to determine if certain groups respond better to one training approach over another. It was also my intent to code each set of pretests and posttests by the location of the testing site to determine if there were any regional phenomena in relation to how the participants learn best.

I used SPSS version 23 and conducted my statistical analysis using an ANCOVA, ANOVA, and paired *t*-tests to interpret my results. I believed the best way of conducting the research was to use the overall test scores to determine the mean and compare the means to determine if there is a statistically significant difference between the experimental groups and the control groups and these tests afforded me the best possible means to make that determination.

Purpose of the Study

The purpose of this study was to improve the understanding of whether there was a measurable difference between counterterrorism training that is solely lecture based (verbal and auditory learning) and one that combines both lecture and a physical demonstration (kinesthetic learning) to emphasize the key learning points to help determine which, if either, are cost effective and provide the government with a reasonable return on their investment of public funds. Currently, several federal agencies such as the Department of Homeland Security (DHS), the Bureau of Alcohol, Tobacco, and Firearms (BATF), and the FBI, to name a few, offer various counterterrorism awareness courses; yet, to date I have been unable to find scholarly research that sought to determine if participants gained any greater level of awareness from these training venues, if there is a measurable difference based upon instructional methodologies, or which, if either, provided the government with a greater return on the investment of public funds.

I set out to determine for the first time if the training made a difference; whether there was a measurable difference in the level of awareness based upon the methods of instruction for the purpose of determining the cost effectiveness of the training. I addressed the gap in the literature as to whether or not tax dollars (public funds) are being spent in the most judicious fashion by comparing instructional methodologies to determine if one method provided a greater level of awareness over the other thus helping to determine if one approach was more cost effective over the other.

Conceptual Framework

The overarching theory from a public policy perspective for this study was the organizational knowledge creation theory (OKCT; Nonaka & von Krogh, 2009; von Krogh, Nonaka, & Rechsteiner, 2012). This theory posits that the key to effective management is discovering ways in which to impart tacit knowledge and explicit knowledge. If explicit knowledge is properly developed in the employees then this increased should positively affect the entire organization across all departments to function more efficiently (Nonaka & von Krogh, 2009; von Krogh, Nonaka, & Rechsteiner, 2012). While the OKCT is normally applied by managers of a single organization (von Krogh, Nonaka, & Rechsteiner, 2012), I have opted to expand the concept of organization to include the entire counterterrorism community as an organization from a macro perspective. I found that by stretching the OKCT to apply to the community at large, it made for the ideal theoretical framework because it helped in the attempt to identify if there was a measurable difference between the instructional methodologies. This also paired nicely with the educational theories that I selected as part of this multidisciplinary study.

The adult learning theory served as the main educational theory for this study (Harper & Ross, 2011; Knowles, Holton III, & Swanson, 2012). The logic behind this theory is that it is important to teach to adults in a manner that they learn best. In the adult learning theory, it is postulated that adults learn best when an instructor has designed the instruction in a way that appeals to the their particular learning style and is more effective when learners are able to engage two or more of the human senses (Cantor, 2001; Federal

Bureau of Investigation, 2009; Harper & Ross, 2011; Kennedy, 2003; Knowles, Holton III, & Swanson, 2012; Sandlin, Wright, & Clark, 2011).

The experiential learning theory (Kolb, Kolb, Passarelli, & Sharma, 2014; Kolb, 2014; McClellan & Hyle, 2012), which served as the second educational theroy foundation for this study, suggests that adults learn best from their own experiences. Both educational theories meshed nicely for the purpose of this study, in that the structure of the study used one modality--lecture--and compared the results of lecture only when compared to lecture with another modality added. In this case, the other modality was the explosive demonstration.

In the lecture portion the adult participants used their sight and hearing for the lecture, but with the addition of the explosive demonstration, participants were able to engage their sense of smell and feeling (pressure waves) to re-enforce the learning principles (Jones, 2014). Adult learning styles should be taken into consideration when teaching adults. An effective instructor should strive to appeal to each the visual, auditory, and kinesthetic learner. This is difficult to accomplish in classroom lecture. The stimulus that the demonstration provided reinforced not only the principles taught to the visual and auditory learners but it also connected with the kinesthetic learners.

In addition to the adult learning theory, the experiential learning theory served as a secondary and a complementary theory to the adult learning theory and is often difficult to separate the two theories because they have overlapping qualities. Kolb's experiential learning (Kolb, Kolb, Passarelli, & Sharma, 2014; Kolb, 2014) which opines that the degree to which adults learn and retain information is directly attributable to the way that

they experience the learning process. While there are numerous types of experiences that may be included in the process when the adult learner is able to experience a phenomenon that correlates with the learning modality that the individual responds best to then learning takes place (Kolb, 2014).

Operational Definitions

The literature includes phrases and terminology commonly used in the explosives and law enforcement community. These terms are defined below.

Chemical Precursors: Chemical Precursors are chemical compounds (a fuel source and an oxidizer) used to create improvised explosives.

Chemical Industry Outreach Workshop (CIOW): The Chemical Industry Outreach Workshop is an outreach effort by the FBI to provide awareness to industry leaders, private and public security and first responders of the dangers involved with the production of improvised explosives by youths, criminals and terrorists. This outreach not only describes the dangers but the ease of access in acquiring the precursors. As will be noted below with the NIEF operational definition, the CIOW is nothing more than day three of a NIEF. The CIOW is also known as the 1-day NIEF and that term is used within the FBI to signify that the training will not involve the first two days of training for public safety bomb technicians or military EOD and will instead solely focus on the industry leaders, the private and public security, and first responders. Note: The research for this study will focus on the CIOW over the NIEF when able simply to eliminate the need to screen for bomb technicians (Federal Bureau of Investigation, 2010a; 2015b).

Detonator: A small explosive charge that is highly sensitive to heat, shock, or friction and serves to initiate a larger explosive charge. Detonators are commercially produced but may be improvised as well.

First Responder: A first responder is a member of a law enforcement agency, a fire-fighting service, or an emergency medical technician (EMT) for the sake of this study. They are the individuals who are most likely to happen upon a scene first in their response to render aid or assistance.

Hazardous Devices School (HDS): The FBI's Hazardous Devices School (HDS) is the only public safety bomb technician school in the United States. All federal, state and local public safety bomb technicians attend the certification and recertification courses at the school and many also receive advanced training at HDS. The School was first created in January, 1971 and was a United States Army run school until 1976 when it became a joint Army and FBI school. The addition advanced courses were instituted by the FBI. On October 1, 2015, the FBI took over running the recertification courses and on October 1, 2016, the FBI took over the certification course as well and the FBI is solely responsible for the certification training of all public safety bomb technicians.

Homemade Explosives (HME): Homemade Explosives are synonymous with Improvised Explosives. They are chemical mixtures that create an explosive compound. These compounds while the precursors may be commercially available the explosive aspect is not commercially or militarily produced thus the term improvised or homemade (National Bomb Squad Commanders' Advisory Board, 2014).

Improvised Explosives (IE): Improvised Explosives are synonymous with Homemade Explosives (HME). They are chemical mixtures that create an explosive

compound. These compounds while the precursors may be commercially available the explosive aspect is not commercially or militarily produced thus the term improvised or homemade (National Bomb Squad Commanders' Advisory Board, 2014).

Improvised Explosive Device (IED): An Improvised Explosive Device is any device that is non-military or non-commercially made explosive device normally used to further acts of terrorism.

National Improvised Explosives Familiarization (NIEF): The National Improvised Explosives Familiarization (NIEF) is a program created by the Federal Bureau of Investigation involving three separate divisions within the FBI. The three divisions were the FBI lab, the Weapons of Mass Destruction Directorate, and the Critical Incident Response Group. The NIEF was created to provide awareness to public safety bomb technicians (PSBT), military explosive ordinance disposal (EOD) personnel, first responders, private and public security, policy makers, and industry leaders. It is a 3-day course in its entirety. The first two days are restricted to PSBT and EOD only. The third day is the outreach portion, in which, attendees receive approximately three hours of briefings and then are provided with a live explosive demonstration as the culmination of the outreach. Note: it is the third day that will be subject to this research (Federal Bureau of Investigation, 2010a; 2015f).

Render Safe: To Render Safe means that an explosive device has been made explosively safe. This does not mean that all threats have been eliminated. For example, a radiological explosive device (RED) that has been rendered safe means that the explosive aspect has been neutralized but the radiological threat would still need to be addressed (National Bomb Squad Commanders' Advisory Board, 2014).

Special Agent Bomb Technician (SABT): A Special Agent Bomb Technician (SABT) is an FBI Special Agent who has been trained as a bomb technician at the FBI's Hazardous Devices School (HDS) in Huntsville, Alabama. SABTs are bomb technicians who possess the same render safe authorities as other federal, state, and local public safety bomb technicians but have the additional responsibilities of working within a WMD environment.

Weapons of Mass Destruction (WMD): A weapon of mass destruction is any weapon designed to create mass casualties.

Weapons of Mass Destruction Coordinator (WMDC): A Weapons of Mass Destruction Coordinator (WMDC) is a specially trained FBI Special Agent who has the responsibility to carry out the mission of the Weapons of Mass Destruction Directorate (WMDD) within a field office. They serve as both a liaison with local first responders and as a subject matter expert in WMDs.

Weapons of Mass Destruction Directorate (WMDD): The Weapons of Mass Destruction Directorate is a headquarters division within the Federal Bureau of Investigation that is tasked with the responsibility to prevent, prepare for, investigate and defend against attacks using Weapons of Mass Destruction (WMD) on the United States.

Limitations, Scope and Delimitations

Limitations

This study did have some limitations in what data was provided. As a result of this study, I have been able to determine whether there is a measurable difference between the programs. What I am not be able to fully explain are the reason why there

was not a measurable difference. The literature supported the reasons why not, but I am still limited in not knowing the students' perspective as to if they believed it was effective or not for them. It also limits the results to the degree of not knowing what particular part was more beneficial compared with other parts of the training but these can all be addressed in future studies.

Scope

This study will apply to all first responders, private and public security, and industry executives. The study was conducted across the United States at various locations. The locations were of varying sizes in the population but the selection criterion was largely based upon availability. The fact this study covered small and large populations, different vocations, varying levels of age, race, sex, and educational levels should allow for the results to be generalized to the greater population. I conducted the study at ten different locations throughout the United States over a six-month period. These ten locations included the pilot study and nine additional locations for the final study.

Delimitations

In the United States as of 2008 there were over 1.1 million sworn law enforcement officials (Reaves, 2011), and as of 2013 there were over 1.14 million firefighters (Haynes & Stein, 2014), and as of 2012 there were at least 239, 100 emergency medical personnel (Bureau of Labor Statistics, 2015), not to mention the number of private and public security personnel, and industry executives. Only a small sampling from each of those vocations are possible due to the cost involved in hosting

CIOW/NIEFs and the limited number of attendees that are able to attend each function due to space limitations.

Significance of the Study

The significance of this quantitative study was to discover if there was a measurable difference on the level of awareness of first responders, public and private security personnel and industry leaders who attend government-funded counterterrorism training initiatives that are lecture based only compared to those training initiatives that offer both lecture and demonstration. The reason that such a study is significant is that it provided public administrators for the first time with empirical data to support whether the training was effective and which helped to determine if either method offers the government the greater return on their investment. This research broke new ground by combining education, counterterrorism and public administration. This was accomplished by using two educational approaches in an attempt to discover if there was a measurable difference in the level of awareness of the participants and from those results a logical conclusion can be drawn as to the cost effectiveness of each approach in comparison to one another. Through this study I sought to discover if an adult learns best in the traditional classroom or is the enhanced by going beyond the lecture. If my study demonstrated that lecture is equal or superior to lecture and demonstration in increasing the level of awareness then the most cost-effective training would be lecture based. However, if the lecture and demonstration prove superior then it is likely that the later though more expensive and time consuming would lead to the most cost-effective approach. To date, I have not found one counterterrorism training program that can

empirically support whether any of the training is first effective and secondly is it cost effective. The theories that were central to this study was the adult learning theory (Arms, 2012; Cantor, 2001; Federal Bureau of Investigation, 2009; Harper & Ross, 2011; Jackson, 2011; Kelly, 2013; Kennedy, 2003; Kenner & Weinerman, 2011; Knowles, Holton III, & Swanson, 2012; Tutuianu, 2012) and the experiential learning theory (Kolb, Kolb, Passarelli, & Sharma, 2014; Kolb, 2014; McClellan & Hyle, 2012; Tutuianu, 2012). Looking at the above one could draw the conclusion that this was a study in education and to some extent that was correct; however, I argue that was exactly why this study was significant because it applied educational theories that could positively affect future policies. It was impossible to accurately understand which method if either was more cost effective from a policy point of view until we first determined if the training was effective, if it was to what degree and which approach provided the most effective. Only after we obtained factual information from an educational perspective could we begin to draw conclusions as to the effectiveness of the training and to determine the most cost-effective approach. This was perhaps one of the greatest flaws in the entire counterterrorism program of the United States government where money is spent without first determining if the training is effective and if effective how can it be done in a fiscally responsible fashion. The importance of evaluating the effectiveness of counterterrorism training cannot be overemphacised the literature has been silent when it comes to providing empircial evidence that such training is effective (Chouinard, 2013). In an attempt to shed light to this matter, it was my intention to study one of the Federal Bureau of Investigation's training programs to conduct this study.

First responders often find themselves in dangerous situations that require them to quickly assess a situation and act appropriately (Galada, Gurian, & Hong, 2013). If the students are learning the material then this response posture should be easily accomplished. However, if the training is not effective then responders are ill-prepared in reacting to an emergency and the training is neither educationally nor fiscally effective. The logic would then follow that if the training is determined to be effective it should continue to be funded. If the training is found not to be effective then the program should be re-worked or eliminated as a waste of tax dollars.

The FBI program referred to above is the National Improvised Explosive Familiarization (NIEF)/Chemical Industry Outreach Workshop (CIOW) program (Federal Bureau of Investigation, 2014b). The rational for using this program vise any other program was that the FBI commonly offers explosive outreaches in two formats lecture only and lecture and an explosive demonstration. The NIEF/CIOW allowed me to test both against one another, in that, when the FBI teaches explosive awareness via lecture only the instructors use the same presentations as the lecture portion of the NIEF/CIOW. This afforded me the opportunity to conduct the two approaches at a single location. The traditional classroom setting presents three one-hour courses. Those courses are the introduction to explosives, introduction to improvised explosive devices (IED), and introduction to improvised explosives (IE) or what some other agencies may refer to as homemade explosives (HME). The NIEF/CIOW uses the same three classes but is followed up with a live explosive demonstration at the conclusion. The demonstration includes a combination of conventional explosives or better known as commercial explosives such as: C4, TNT, and the like; and several examples of improvised

explosives that are created with every day products such as sugar, brake fluid, pool shock and other products that can be purchased from local stores. The reason that determining whether there is any measurable difference is that the classroom training is very inexpensive; whereas, the lecture with demonstration is rather expensive. The demonstration requires at a minimum three bomb technicians, at least two to set up the range and at least one to teach the lecture portion. The physical cost per demonstration is $750.00. While that may not seem expensive the FBI offers this training at least 112 times per year. This cost does not include the wages of the involved technicians nor does it consider the travel cost, lodging, per diem, fuel, rental cars, etc. If there is no significant difference then there is little benefit to continuing the training initiative without re-working the program. If it does make a measurable difference then it is a worthwhile expenditure.

Summary

Chapter 1 has included an overview of the importance of explosive awareness training in the defense of the nation. It has also demonstrated that it is important from a policy standpoint to identify ways that will improve the return on tax-payer dollars. Chapter 1 has provided the background and rationale to the study. It has also set forth purpose of conducting this quantifiable study and its relationship between public policy and education which will measure the level of awareness of participants to help identify the governments' return on investment. Chapter 2 will include a review of the literature that I believe is pertinent to the study. In Chapter 3, a description of the research methodology and will include an account of the tools used in the study and will also

describe the population that was studied, how the study was designed and how it was analyzed. The results of this study will be discussed in Chapter 4 and I will share my conclusions and recommendations in Chapter 5.

Chapter 2: Literature Review

Introduction

This chapter includes a review of the literature, in which I explore how policy decisions can be made in regard to counterterrorism awareness training and the cost effectiveness of such programs. This can be accomplished by making policy decisions based upon the application of educational theories which compare instructional methodologies. This comparison of methodologies helps to produce the most cost-effective approach and additionally it identified the methodology that provided for the most effect means of knowledge acquisition.

Since the 9/11 attacks, the United States Government has funded a plethora of antiterrorism and counterterrorism measures, such as increased security, aggressive law enforcement techniques, providing equipment to state and local governments, and training. For example, in fiscal year 2012, $1.3 billion was allocated for preparedness effort to include homeland security training (Department of Homeland Security, 2012) and in the first 10 years following 9/11, the United States Government has spent more than one trillion on Homeland Security initiatives and training events (Mueller & Stewart, 2011).

One critical flaw of this approach is the lack of empirical data to either support or refute the effectiveness of the expenditures. The intent of this study was to examine one aspect of these expenditures: training. Whether we call it antiterrorism or counterterrorism training is a matter of semantics, the important question is to determine

if the training makes a measurable difference. If the training does increase awareness then it is a reasonable expenditure, if not then it should be considered wasteful government spending which is an area of concern for public administrators.

This review included an eclectic composition because it seems that the effectiveness of either antiterrorism or counterterrorism training has escaped the interest of public administrators and the specific topic seldom seems to be of interest in current scholarly literature. It is for this reason that my literature review crossed multiple disciplines to address the subject and to demonstrate that not only is my topic relevant but one that should be studied in-depth and question if tax dollars are being spent wisely. It does little good to expend government funds unless my study or other studies that may follow are able to provide empirical evidence of a correlation between cost and return of the investment. It is for the reasons stated above that this literature review includes such topic areas including: experiential learning, adult learning, training of first responders, homeland security, public policy, research methods, the Solomon four group design, and a brief overview of bombing incidents over the past 45 years.

Organization of the Literature Review

The review begins with an examination of the literature that specifically addresses policy or budgetary subject matters as they relate to either antiterrorism or counterterrorism programs. Next, I address the educational theories that served as the foundation from which to identify what makes training effective. In order to accomplish the former, I reviewed the educational literature surrounding Knowles' adult learning theory and Kolb's experiential learning theory. It should be further noted that it is often difficult to separate the two because they are so interwoven with one another. I also

examined the literature that was specific to training for first responders. In addition to the review of training of first responders, I focused on the literature surrounding homeland security as it pertains to the United States. I will follow this discussion with a literature review of the methodological approach that I used to collect the data from which the study's conclusions and recommendations were drawn. The literature review concludes with a snapshot review of bombing incidents that have taken place in the United States and around the world to demonstrate the importance of studying explosives and explosive awareness.

Theoretical Framework

The study of counterterrorism prevention and preparedness only gained significant notice after 9/11. The events of 9/11, vastly changed the way the United States government postured against the threat of terrorism and affected Americans through these security changes (Hart & Ramsay, 2011).

Prior to the events of 9/11, most Americans viewed acts of terrorism attacks were viewed as something that happens elsewhere but not in the United States (Hart & Ramsay, 2011). The first attack on the World Trade Center in 1993 sparked some interest, but because the attack only had limited success, most Americas soon forgot the attacks and went on with everyday life (Mahan & Griset, 2013). In 1995, Timothy Mcveigh bombed the Alfred P. Murrah Federal Building in Oklahoma City; however, McVeigh was quickly apprehended and the interest soon dissipated (Federal Bureau of Investigation, 2015g; Shughart II, 2006). The USS Cole bombing demonstrated that

terrorists could be successful in their attacks, but because it happened overseas was soon forgotten (Federal Bureau of Investigation, 2015e; Nacos, 2012; Shughart II, 2006).

Then on September 11, 2001, Americans had to face the reality that terrorist could be successful in attacking the homeland and that the United States government had to prepare for the worst. On September 11, 2001, terrorists boarded American Airlines Flight 11, United Airlines Flight 175, American Airlines Flight 77, and United Airlines Flight 93 and overpowered the flight crews and hijacked the aircrafts (Tracy, 2012). At 8:46 a.m. the first plane--American Airlines Flight 11, originally destined for Los Angeles from Boston--crashed into the north tower of the World Trade Center. Seventeen minutes later, at 9:03 a.m., the second plane--United Airlines Flight 175 which had also departed from Boston heading to Los Angeles--crashed into the south tower of the World Trade Center. Then at 9:37 a.m., American Airlines Flight 77--heading from Washington Dulles to Los Angeles--struck the western façade of the United States Pentagon. The fourth plane--United Airlines Flight 93, from Newark to San Francisco--crashed in a field in Somerset County Pennsylvania at 10:07 a.m., due to the efforts of passengers to regain control of the plane. While they lost their lives, these passengers saved countless other lives in the process. FBI investigators theorized that Flight 93 was heading to the United States Capitol building but as a result of the passengers attempt to regain control the hijackers deliberately crash the plane prematurely (9/11 Commission, 2004).

As a direct result of these events, the Department of Homeland Security (DHS) was created, combining 22 separate agencies under one department (Kemp, 2012). Additionally, almost overnight the FBI began its transition from primarily a criminal

investigative agency with some terrorism related intelligence functions, to an intelligence agency with some criminal investigative processes.

It was during this same time that government officials identified gaps in the United States prevention and preparedness framework, in that there was no established framework (Hart & Ramsay, 2011). In haste to fill the gaps no research was conducted in how to best prepare and prevent for future terrorist events; instead, it became an issue of spending as much money as possible to look as if progress was being made without the consideration of the effectiveness of the programs being funded (Department of Homeland Security, 2012). Money was allocated to states for the first time to provide for equipment and training with very few measures in place to see how money was spent.

Since then, the DHS has become far more structured regarding the way in which funds are allocated and how money is spent (Department of Homeland Security, 2012). This effort has proven more effective in terms of typing of equipment but has still lagged behind in terms of the quality and types of training. There are numerous modalities of types of training provided by the different federal agencies in terms of prevention and preparedness, but until recently they have only just begun typing the training like they have for equipment (Mueller & Stewart, 2011). The next logical step is to determine the effectiveness of the different types of training. The purpose of my research is to be among the first to measure the effectiveness of the training in terms of an increased level of awareness.

I have chosen to focus on the aspect of explosive awareness, which is even more difficult to study than most other types of counterterrorism training because of the

restrictive access that has been traditionally applied to this field. The reasons that explosives are difficult to study is that explosives and IEDs and how they function has traditionally been a closely guarded secret among military explosive ordnance disposal (EOD) and civilian public safety bomb technicians (PSBTs). Nonpeer-reviewed journals, such as the International Association of Bomb Technicians and Investigators (IABTI) vets every applicant to ensure that they have a specialization in explosives via the military or law enforcement before granting membership as a means to control the inadvertent release of protected information. The reason for this protocol has always been to protect those technicians' lives by limiting information so that would-be bombers would not know their training, tactics, and procedures (TTP). Without these protocols, bombers could discover methodologies that could make render-safe operations even more dangerous than it already is.

However, in light of the increased propensity for terrorist attacks to happen in the United States, the explosives community has become more willing to open up and expose first responders and industry personnel to the realities that they are forced to face and must be adequately prepared for the emerging threats that they will inevitably encounter. It is my belief that this gap in empirical research is due to one of two reasons or perhaps a combination of the two. The first is that scholars have chosen to focus on other areas, either out of a lack of knowledge that such training exists or from the previously noted fact that the explosives community is a closed society that limits access. I believe that is where my study is among the first, in that, I have been a member of this closed society for nearly 18 years and have trusted access that others may not.

For the theoretical framework of this study, I looked to the organizational knowledge creation theory (OKCT; Nonaka & von Krogh, 2009; von Krogh, Nonaka, & Rechsteiner, 2012). The OKCT posits that the key to effective management is in discovering ways in which to impart tacit knowledge and explicit knowledge of whatever the facets deemed important such as manufacturing, and marketing across the entire organization to make the organization function more efficiently (Nonaka & von Krogh, 2009; von Krogh, Nonaka, & Rechsteiner, 2012). Normally the OKCT is applied to a single organization at the microlevel whether it is a public organization such as the Center for Disease Control (CDC) or a Fortune 500 company such as Apple.

For this study, I would like to apply the OKCT at the macrolevel where the concept of "the organization" applied as a conglomerate of groups or organizations that come together for the purpose of terrorism prevention and preparedness. The purpose for my study was to measure if there was an increase in the level of explosive awareness of the counterterrorism training participants. I found this to be the ideal theoretical framework because my goal in this study was to determine if there was a difference in the level of awareness when comparing classroom lecture alone to classroom plus demonstration. I wanted to investigate the demonstration aspect of the training because the explosives used in the demonstration impacts human senses and should, in theory, impact the learner's tacit knowledge. If tacit knowledge was gained through the affecting the human senses, it is likely to expand to explicit knowledge. Explicit knowledge translates into intimate knowledge which is the ability to react without thinking (von Krogh, Nonaka, & Rechsteiner, 2012).

Public Policy and Counterterrorism

Searching Sage using the search term *counterterrorism* yielded 454 results. Of those 454 results, the vast majority of the topic areas focused on such counterterrorism issues as:

(A) international or transnational partnerships,

(B) intelligence sharing,

(C) foreign aid,

(D) policy effectiveness,

(E) legal implications, deterrence,

(F) the effectiveness of terrorist organizations against counterterrorism efforts,

(G) the effects on commerce,

(H) law enforcement as actors against acts of terrorism,

(I) defensive measures,

(J) profiling of Muslims,

(K) privacy concerns, and

(L) human rights.

From the literature, available there was little that referenced counterterrorism training and its effectiveness or the lack there of such training. When I narrowed the scope of the search to counterterrorism and training the results were 197 articles. There were fewer than 30 literature sources of value concerning the topic of counterterrorism and training that illuminated the importance of training as it relates to counterterrorism. When looking at policy decisions as they relate to homeland security and terrorism

preparedness, scholars and police agencies often apply the contingency theory perspective (Haynes & Giblin, 2014).

The contingency theory posits that in order for police agencies (and I would extend that to emergency managers in general) to meet their goals, there is a constant evaluation of risk as it relates to homeland security activities (Haynes & Giblin, 2014). Contingency theory as it applies to homeland security is the perceived risk an agency faces as it relates to their external environment. The unfortunate part of the risk is that it is based upon the agency's top executives who weigh the odds based on their training, their experience, and to some extent their gut instincts (Haynes & Giblin, 2014). While training and experience are invaluable tools, the downside is that what is perceived by the individual may inadvertently lead to profiling either by race, ethnicity and/or religious beliefs (Haynes & Giblin, 2014).

One aspect of the contingency theory as it relates to terrorism is the type of likely attack. Contingency theory is a major contributing factor in how agencies react to counterterrorism preparedness (Burruss, Giblin, & Schafer, 2010). I believe that much of the risk versus environmental factors is derived directly to the type, amount and frequency of homeland security training an agency receives (Burruss, Giblin, & Schafer, 2010). I also believe that the contingency theory is contributing factor not only for the agencies that participate in the training and risk assessment, but the theory also affects nearby agencies that choose to be included in the cause. The smaller agencies see how larger agencies are involved thus the smaller agencies who do not want to be left out believe that they too must be involved. Each agency trying to improve their agencies

equipment and abilities has created a snow-ball effect in homeland security preparedness (Burruss, Giblin, & Schafer, 2010).

This then again illustrates the importance of counterterrorism because not only are those agencies that are forward leaning better prepared but that nearby and smaller agencies tend to get involved so as not to appear different than their counterparts. This then further solidifies why the appropriate training venues are worthy of research, in that, they help to prepare numerous agencies against potentially threatening situations (Burruss, Giblin, & Schafer, 2010).

The most likely avenue of attack has been and continues to be the use of explosives and is a world-wide epidemic (Paydar, et al., 2012). Training should be a priority for first responders in emergency management but it must be done in such a fashion that strikes a balance between better acquisitions of the learning material and done in such a manner that it provides the best cost-benefit ratio and the best return on investment for the public agency (Gjefle & Vikari, 2012; Mueller & Stewart, 2011). So, when looking toward the terrorist use of explosives and combine that with the need to train first responders in such areas as post-blast and explosive awareness (Sorensen & McGill, 2012) it makes sense that from a policy stand point it is important to determine how best to acquire this knowledge. This is not to say that the United States government has not pursued training of first responders in an aggressive manner, in fact, it is quite the opposite. From 2001-2011 the United States government spent in excess of one trillion dollars (Mueller & Stewart, 2011) to provide the necessary training to prepare responders to counter or recover from future attacks (Turner, Glantz, & Gall, 2013) what has not

happened is for the academic community to show an interest not only in the training initiatives but the effectiveness of such (Gjefle & Vikari, 2012).

While the private and the public sector has embraced the need for awareness, preparedness, and counterterrorism training (Chouinard, 2013) to date I have not discovered significant academic literature to support an interest into to these initiatives as noted above nor have I been able to discover any scholarly literature looking at these training measures from a policy stand point. As noted early the United States government has spent over one trillion in homeland security measures (Mueller & Stewart, 2011) but there still remains a gap in the literature from a policy stand point on the effectiveness of these training initiatives. However, in the medical community therein lies a plethora of articles which test the effectiveness of medical training (Adamson, 2012; O'Malley, Marseille, & Weaver, 2013; Saiboon, et al., 2014). Furthermore, it seems to be common practice within industry to not only measure the effectiveness but to conduct regular benefit-cost analysis (BCA) to measure the effectiveness of such programs (O'Malley, Marseille, & Weaver, 2013). This should be of interest in the academic community at minimum in the public sector where government funds are allocated in support of such measures. In fact, government programs by regulation are support to demonstrate that programs and other governmental initiatives are not only effective but that they provided the best return on investment for the dollars spent (Cecot & Viscusi, 2015). The Administrative Procedure Act (APA) has required federal agencies since 1981 to provide empirical evidence that the programs are effective and that they must conduct a BCA to demonstrate the return on investment (Cecot & Viscusi, 2015). I can only hazard to guess

that that the reason that homeland security and homeland preparedness training has not been fully vetted is because they simply have not caught the attention of the courts to ask why have not these programs been fully vetted and may remain of little interest until the point that someone files suit against the United States Government. It is then and only likely then that this will capture the attention of both the courts and scholars.

Determining the cost effectiveness of counterterrorism training is an inexact science that does, at times, make it complicated to properly estimate if such training is effective or not. Counterterrorism efforts are an expense that continues to the tune of approximately a 9% growth rate per year since 2001 (Sandler, 2014). Why is there a need for such an increase in spending each year? The answer lies in the fact that although economic growth is largely not affected by acts of terrorism the Gross Domestic Product (GDP) does suffer a negative impact on the economy of terrorists' target (Sandler, 2014). So then if the expenditure itself is unavoidable then does it matter if effectiveness in counterterrorism training an issue worthy of study? I would have to say a resounding "yes" because one study has estimated that all counterterrorism efforts are believed to only provide less than ten cents on the dollar return (Sandler, 2014). An example of both direct and indirect expenses one need not look any further than the Madrid bombing in 2004 and the London bombings in 2005. Not even considering the loss of life and injuries sustained in those events direct costs estimate was $5 billion per incident and another $2 to $3 billion in indirect costs (Mueller & Stewart, 2011). If this is true then it makes sense that if we are able to find any way, in which, we can improve the return on investment then we are wisely allocating tax-payer dollars. This does not mean that all areas of

counterterrorism should not be examined the contrary is quite true. Every facet of the counterterrorism effort must be reviewed and measured for effectiveness, but that is beyond the scope of this research.

The former paragraph also demonstrates the importance of quality training to prevent and prepare for potential acts of terrorism is worthwhile if the effectiveness of spending can be demonstrated. This then leads to the next point that counterterrorism training should be looked at not only from a policy standpoint and an economic standpoint but also from an educational standpoint. An educational effectiveness goes hand-in-glove with policy decision making and cost effectiveness and must be considered when training is involved (Naylor & Wooldridge, 2014). This further explains why a multidisciplinary approach that considers theories in education to help make the proper policy-based and economic-based decisions.

Review of Education Literature

The next section will be the review of educational literature specifically focused on two educational theories the experiential learning theory by David A. Kolb (2014) and the adult learning theory as developed Malcolm S. Knowles (Knowles, Holton III, & Swanson, 2012). While there are many different types of educational theories I have opted to focus my attention on the two previously noted, in that, I believe they are central to my research.

Experiential Learning

Prior research has demonstrated that students of experiential learning tend to be more confident because it affords them the opportunity to learn in a safe environment which then makes them more competent in their work as professionals (Clem, Mennicke, & Beasley, 2014). It has been found that adults tend to learn better through their experiences and in the field of critical incident response positive results have been developed through three-dimensional interactive computer simulations which require the participant to become part of the experience and thus demonstrate the retention of material through the environmental exposure (Adamson, 2012; Kolb, 2014; Tawadrous, Kevan, Kapralos, & Hogue, 2012). This is a significant aspect because it clearly demonstrates how adults are able to learn not only through their experiences but through their environment as well. It is not only important for students to learn through experiences but it is equally important for educators to prepare themselves to teach through experiences because most teach the way they learn and that greater learning will take place if such steps are taken (Kolb, Kolb, Passarelli, & Sharma, 2014). A recent study that conducted a meta-analysis of training effectiveness found that in a majority of the studies that training delivery methodology had significant implications (Blanch-Hartigan, Andrzejewski, & Hill, 2012). The study determined that training that was solely lecture based (instruction only) was non-significant, but any training vehicle that included two or more instructions methodologies, such as: instruction and practice; instruction and feedback; practice and feedback; or instruction, practice and feedback all demonstrated significant findings, thus making the training more effective (Blanch-Hartigan,

Andrzejewski, & Hill, 2012). Results from a similar study provided that "students who participate in an experiential learning objective that is directly related to their future practice are able to hone the skills needed to perform professional responsibilities" (Clem, Mennicke, & Beasley, 2014, p. 504).

What is often forgotten is the way adults process material. Lecture tends to be quickly forgotten but when an adult is able to experience that which was just taught through demonstration or simulation helps to imprint the memory from the experience (Kolb, 2014). However, the learning is not completed until the adult has the opportunity to reflect and assess that experience which they have just been exposed (Green & Ballard, 2011). It is believed that reflection and assessment help to transition memories from short-term to long-term memories (LaRocque, et al., 2015). In the next section, we will look at the literature surrounding the adult learning theory. Similarities will be noticed as well as a great deal of crossover from one theory to the next.

Adult Learning

Adult learning has been a focus of studies for many years but even today researchers do not agree on any central theory. Several of the studies seem to overlap one another in some aspect; yet no one theory answers the question of how adults learn best (Roessger, 2012). There has been a great deal of research that demonstrates that adults learn best when they are actively engaged in their own educational pursuits especially when the training media is in such a format that it causes the learner to engage multiple human senses at the same time (Arms, 2012; Bohonos, 2014; Cantor, 2001; Feemster, 2010; Kelly, 2013; Tutuianu, 2012). One of the points that must be considered is the age

of the student. Adult learners especially those considered non-traditional students have numerous personal reasons for returning to the classroom (Bohonos, 2014). Among those reason could be advancement in their current job or in planning for the next career (Bohonos, 2014) determining ahead of time and preparing to address those needs are critical in ensuring that the adult learner will connect that which is being taught and translating it into how they can use that information effectively in their own lives (Cantor, 2001). It is also important to understand how adult learners think and interact in a training environment. Adults have to be actively engaged in their own learning experience and in an environment, that allows for a give and take exchange between the learner and the instructor (Arms, 2012; Beavers, 2009).

Another important aspect of adult learning is that when designing training the designer must consider some of the challenges that face adult learners that are dramatically different than that of teaching a child or an adolescent. Adults have both internal and external stressors that can inhibit their learning. Among those is the fear of failure, work, finances, and family but to name a few (Kenner & Weinerman, 2011). In addition to the challenges faced by the adult learner is the instructor's need to be able to connect the material to the students' preferred learning style (Rolfe & Cheek, 2012). Any time that adults or children enter the classroom the instructor(s) should be focusing on the delivery of the material in such a way that effects quicker acquisition of the material. This means that the instructor(s) must find a way of connecting with the visual learner, which is those who learn best by simply seeing the material (Beavers, 2009; Cantor, 2001; Feemster, 2010; Rolfe & Cheek, 2012). The instructor(s) are also responsible to appeal to

the auditory learner who learns best through what they hear (Beavers, 2009; Cantor, 2001; Feemster, 2010; Rolfe & Cheek, 2012). The third type of learning style is that of the kinesthetic learner or one that learns best through hands-on participation (Beavers, 2009; Cantor, 2001; Feemster, 2010; Rolfe & Cheek, 2012). When speaking of hands-on we must not solely look at touch or feeling as the only indicator of hands-on. We must also add into that category taste and smell as well when considering a kinesthetic approach. An example would be making a pizza for the first time. The learner's experience would be solidified not just by the process of making the pizza by hand but remembering the smell of the pizza cooking and the taste afterwards thus synthesizing the process. Studies have demonstrated as the number of human senses engaged are increase during the experience (i.e. see, hear, feel, taste, and smell) the knowledge level and retention increases exponentially (Bedir & Onkuzu, 2014; Harper & Ross, 2011; Rainer & Timmerer, 2014; Timmerer, Waltl, Rainer, & Hellwagner, 2012). Herein lies the challenge on how does an instructor accomplish such feats? One way is to alter a students' perception about a topic by taking them out of the classroom environment into an area that they are unfamiliar with and which requires them to adapt (Blanch-Hartigan, Andrzejewski, & Hill, 2012; McClellan & Hyle, 2012) which also demonstrates how closely adult learning and experiential learning are intertwined. This does not mean however that there are not those who disagree with the belief that instructors should teach to the students' style of learning. The result of one recent study posits that when students are taught to their preferred learning style that the instructor is actually doing a disservice to the student because it does not allow for the student to strength their weaker learning styles and thus those skills remain dormant (Rogowsky, Calhoun, & Tallal, 2015). Little

credence should be given to a sole study that runs contrary to long established empirical evidence; but it is worthy of note none the less. Now that the educational theories that will be applied to this research I would like to move to the review of literature as it relates to first responder training and homeland security prevention and preparedness efforts.

Review of First Responder and Homeland Security Literature

This next section will take a brief look at the literature surrounding first responder training and homeland security prevention and preparedness efforts. It should be noted when referring to first responders police are the group that immediately come to mind, but it should not be forgotten that first responders in the broader sense includes not only police but fire fighters, emergency medical service personnel and the like**.**

First Responder Training

In discussing first responders, training and terrorism the first question that may come to mind is whether this topic is even worthy scholarly interest? To answer that question, one need not look any further than the anthrax scares in 2001. Due to a complete lack of understanding and training concerning the dangers of Bacillus anthracis numerous first responders and civilians were unnecessary exposed to anthrax which lead to severe illness in some and even death to others all because of a lack of preparedness (Galada, Gurian, & Hong, 2013). Following those events training and awareness became a priority but one of the challenges in emergency management is maintaining a consistent level of training across intergovernmental agencies. It is difficult at all levels to have a standard of training because larger agencies have more personnel and larger budgets and

the opposite for smaller agencies that due to limited resources often lack the training of the much larger agencies (Caruson & MacManus, 2011). Overall, when offered the opportunity to participate in training that involves multiple methodologies those individuals who serve in law enforcement was one group of the professions that had a tendency to retain the material better than those who lacked the professional background (Blanch-Hartigan, Andrzejewski, & Hill, 2012). One of the difficulties that face first responders and policy makers alike is that while there exists significant information on terrorism and terrorism policies the missing link is often the how to move from concept to operationalization in the classroom (Jackson, 2011). This is where adult learning, experiential learning, policy, homeland security, first responders, private and public partners and counterterrorism strategies all come together and is the impetus of this study and that is through the combining of all the previously mentioned into practice either via the modalities of table-top exercises, role-playing, simulation, and/or demonstrations that help bring theory to a reality (Jackson, 2011).

What is a bigger problem facing first responders and especially police as first responders is the fundamental shift is their responsibilities (Roberts, Roberts Jr, & Liedka, 2012). Since 9/11, the role for first responders and as stated early the police most specifically are their role in preventing future acts of terrorism. No longer are they simply preservers of the peace, today they must be vigilant in identifying possible terrorism, be able to be collectors of intelligence and be able to identify the hazards associated with working in such an environment (Roberts, Roberts Jr, & Liedka, 2012). This transition has been difficult and it has not been experienced in a universal and even fashion

(Roberts, Roberts Jr, & Liedka, 2012) because larger departments with robust budgets are better able to plan, train and prepare for the eventuality; whereas smaller agencies scrape to get by and have little to none of the training and financial support to carry out this new role (Roberts, Roberts Jr, & Liedka, 2012).

Homeland Security/Preparedness

After the events of 9/11, homeland security and homeland preparedness was on the forefront of the United States citizenry. Among the homeland security and homeland preparedness efforts was to train and prepare responders for the threat against acts of terrorism. Among other strategies it was quickly realized to be effective the training had to have an emphasis on improving intelligence activities via the delivery of terrorism preparedness training material (Smith, et al., 2012; Turner, Glantz, & Gall, 2013). The way that the designers accomplished these tasks were by conducting vulnerability assessments. These vulnerability assessments served as a means of helping the planners to decide what type of training was essential to members of the public safety and emergency management community (White, 2014). Another reason that vulnerability assessments played a critical role in the development of training is that it also provided a means for conducting cost-benefits analysis (CBA) (White, 2014). While there have been great strides in an attempt to better prepare the workforce against terrorist attacks it has not come without criticisms (Donahue Jr., Cunnion, Balaban, & Sochats, 2010). There does seem to be a great deficit in training as it relates to the effectiveness of the training. In other words, while the training is being provided the learners may not be receiving the information in a fashion which they are ability to link the material presented to the

necessity in their everyday work experience (Donahue Jr., Cunnion, Balaban, & Sochats, 2010). That is why it is important to investigate which methods best prepare the learner in connecting the material to everyday life. It is important to determine for the type of training whether or not the learner acquires the knowledge through traditional classroom work, demonstration, video, simulations, online or a combination of methods (Renda-Tanali, 2012). Among the agencies that provide preparedness training the Federal Bureau of Investigation (FBI) is one of the most prolific in their quest to provide quality training and develop strategic partnerships with both the private and the public sectors (Federal Bureau of Investigation, 2014a; 2014b). However, the FBI portrayed in the movies and on TV is much different and is an organization that while at times has had many missteps is an organization that makes protecting the United States against future attacks and in apprehending those that would attempt to cause harm to America its top priority (Bjelopera, 2013).

One area that must also be established when considering the study of explosive awareness training involving improvised explosives and/or homemade explosives is what exactly is considered an awareness level when referring to explosives and their use. Until recently there lacked a workable definition of what is considered when referring to obtaining a level of awareness in regards to explosives. Before we can identify what is considered an awareness level of improvised explosives or homemade explosives one should understand that improvised explosives (IE) and homemade explosives (HME) are synonymous terms. The reason for the two separate names is anchored into the culture of two federal agencies. The FBI refers to this type of explosives as IE. The Bureau of

Alcohol, Tobacco and Firearms (BATF) chooses to call this type of explosive HME. Neither agency has been willing to change lexicon so both terms are used interchangeably. For the simplest of explanations IE/HME is a non-commercially, non-militarily manufactured explosive family. They are explosives that were not legally manufactured that can be anything from complex chemical make-ups to simple household products. Now it is important to understand what IE/HME awareness level is. It is deemed as the level that "first responders, general search teams, and private sector personnel…are individuals who are likely to observe the sale of IE/HME precursors or discover IE/HME or precursor chemicals in illicit manufacturing situation and who have been trained to initiate an emergency response sequence by notifying the proper authorities" (National Bomb Squad Commanders' Advisory Board, 2016, pp. 2-3). The guidelines set specific identifiers to both quantify and to qualify an individual's level of awareness and those criteria will be used to help design the testing instruments.

In addition to teaching first responders one should note from above quote that first responders were not the only ones mentioned. Homeland security measures extends not only to first responders or emergency preparedness personnel but to "…general search teams, and private sector personnel" (National Bomb Squad Commanders' Advisory Board, 2016, p. 2). These groups that are being referred to are groups such as the Community Emergency Response Teams (CERT), Fire Corps (FC), USAonWatch (USAOW), Medical Reserve Corps (MRC), Volunteers in Police Service (VIPS), Corporation for National and Community Service (CNCS), Infragard (IG), or other such like groups that volunteer their time and efforts to combat or prevent future acts of

terrorism (Flint & Stevenson, 2010; Kemp, 2012). Federal agencies under the Department of Homeland Security or the FBI provide numerous types of terrorism awareness topics to help prepare the force in an attempt to close intelligence gaps (Kemp, 2012).

When presenting training to any group, but even more so to first responders one thing that is proven is that classroom-based, video-based, or an online instructional experience does not adequately prepare the first responder to address every day events or emergency encounters (Gjefle & Vikari, 2012). What have proven most effective are activities in which first responders are required to synthesize the material and to incorporate in some method of simulation or demonstration (Gjefle & Vikari, 2012). Now that the literature concerning first responders and homeland security prevention and preparedness have been review I would like to take a brief look at the literature as related to research methods.

Review Literature Related to Methods

This research will be conducted as a quantitative study which is an appropriate design for this study. The purpose of this study is to determine if there is a measurable difference in the level of awareness comparing two instructional delivery modalities. While a mixed-method approach could provide statistical evidence along with perceptual evidence of the participants, as the research question as written is best served as a quantitative study. A quantitative method is a fairly straight forward approach will help to determine if there is a measurable difference in the level of awareness or not. While not a reason for selecting a method the added benefit of a quantitative approach is that non-scholars such as public administration executives being number driven may wake up and

take notice as well, which could then spark an interest in future research from both scholars and practitioners. I believe that if this study can empirically prove or disprove the theory first then one could later conduct a follow-on study to qualify such training. While both are of value, in terms, of policy making decisions statistical quantitative data will likely sway those in a position of authority to take notice and is why I am limiting this study to a quantitative approach.

This research will be of a classical experimental research design, in which, control can be maintained throughout of two comparable groups (Frankfort-Nachmias & Nachmias, 2008) which are randomly assigned to each of the groups. What this will provide is a controlled experiment that will measure the difference (if one exists) in the level of awareness of the participants. This will provide administrators with empirical data if a change occurs or not and the policy implications are great because of the fact that administrators will have numeric data from which to base their decisions on.

The specific research design that I have employed is the Solomon four group design. While seldom used the Solomon four group (S4G) design is one of the most rigorous research designs (Braver & Braver, 1988). The S4G design is considered rigorous because the design allows the researcher the tools to test one control and one experimental group with a pre-test and one control and one experimental group does not take the pretest (Campbell & Stanley, 1963). This is significant because the pretest allows the researchers the ability to measure the mean difference between the pretest and the posttest to measure learning (McGahee & Tingen, 2009). This design further affords the researcher the ability to determine if the pretest sensitized the learner (test taker) for the

posttest (Adamson, 2012; Campbell & Stanley, 1963). The third aspect that is valuable in the S4G design is that the control groups are administered the posttest before the treatment (or without treatment) and the experimental groups are administered the posttest after the treatment (Ponirou, et al., 2014). The results can then be used to determine if there is a measurable difference in the results of the control group from that of the experimental group (Weinrich, et al., 2007).

The one negative aspect of the S4G design is that no one testing method can measure for all six sets of testing groups (Campbell & Stanley, 1963). What that means is that it is impossible to run a test that can measure the pretests (one control and one experimental) against the control group posttests and the experimental group posttests. The pretest can be measured for sensitizing by comparing it against each group individually such as pretest control against posttest control. Then run the test experimental pretest against experimental posttest but they cannot be run at the same time. Then the last is measuring control group posttest against experimental posttest also has to be run separately (Campbell & Stanley, 1963). It is still contended that even with the fact of having to run multiple tests it is still considered the most prestigious method (Campbell & Stanley, 1963). Having now reviewed the literature on research methods, I would like to transition to one final area for the literature review and that is a review of literature as it relates to terrorism and explosives.

Review of Literature of Terrorism and Explosives

In conducting this study, one might ask why it is important to study specifically explosives and/or bombing when discussing terrorism. The reason becomes apparent

when statistics demonstrate that world-wide from 1970 through 2014 terrorists were responsible for at least 141,966 recorded acts of terrorism. During that same period, it is reported that of the 141,966 attacks that 68074 of those attacks were bombings or the use of explosives in conducting the attacks. This translates to bombings or explosives serving as the means of attack in 48% of all acts of terrorism and in the most often deployed method of attack (Global Terrorsim Database, 2015).

It is for this reason that it is important for the United States government to host training that involves educating the public and emergency response personnel as to what explosives are, how they can be deployed, the risks associated with explosives, and how they can each do their part in preventing further acts of violence. In the following pages, I conducted a review of numerous bombings to illustrate the importance of why homeland security and terrorism prevention are important and worth studying. The next several pages will provide a small sampling of some of the more prolific bombing incidents that have transpired over the last 45 years. It should be noted that two points are of worthy note. The first is that the below listed account for less than one half of one percent of all the bombing incidents. The second point to take notice of is that in the earlier bombings property damage was the prevailing goal but in the last two decades the trend has moved toward killing and maiming people.

Weatherman Underground Bombing 1971

March 1, 1971 the Weathermen Underground, a left-wing group bombed the Senate wing of the United States Capitol building in Washington, D.C. While the damage was significant luckily no one was killed in the bombing (Shughart II, 2006).

FALN Bombing in New York

On January 24, 1975, the Fraunces Tavern, which is famous because history tells that it was the location that General Washington said farewell to his troops. The tavern located in New York City was one of 49 targets of the FALN a Puerto Rican nationalist group. This attack left four dead (Bovsun, 2012).

Weatherman Underground Bombing 1975

Similar to their 1971 bombing of the United States Capitol building on January 29, 1975 the Weathermen selected the United States State Department building located in Washington, D.C. As in the 1971 bombing it resulted in property damage but no deaths. This group published communiqué annotated as "Weathermen" hence the colloquial used when describing the group. The group also claimed credit for bombing the New York City Police Headquarters. The group was also credited with other like bombings of the era (Federal Bureau of Investigation, 2015i; Mahan & Griset, 2013).

TWA Terminal Bombing

On December 29, 1975 at LaGuardia Airport in New York City a bomb that had been hidden inside a locker inside the TWA terminal detonated and resulted in the deaths of 11 people and injuring 75 others. To date no arrests have been made (Boltz Jr, Dudonis, & Schultz, 2012).

Pan Am Terminal

May 16, 1981: A bomb explodes in a men's bathroom at the Pan Am terminal at New York's Kennedy Airport, killing a man. A group calling itself the Puerto Rican Armed Resistance claims responsibility. No arrests are made (Fishman, 2013).

Beirut Bombings 1983

On April 19, 1983 the United States Embassy in Beirut, Lebanon was bombed. The bombing resulted in the deaths of 63 people in all to include 17 Americans (Worley, 2015). Then a few months later on October 23, 1983 trucks loaded with explosives were detonated at the United States Marine and French barracks in Beirut, Lebanon. In the aftermath, it was determined that nearly 300 people lost their lives as a result of the bombing attacks (Levitt, 2013; Worley, 2015).

United States Senate Bombing 1983

Late into the evening on November.7, 1983 a bomb blew a hole in a wall outside the north wing of the Senate chamber at the Capitol in Washington. No one was hurt. Two leftist radicals were arrested and later plead guilty (Evans, 2010).

Pan Am Flight 103

Less than 40 minutes after take-off from London’s Heathrow Airport on December 21, 1988, the New York bound Pan Am flight 103 suffered a mid-air explosion later to be determined to have been a bomb located on board the aircraft. The aircraft was over Lockerbie, Scotland at the time of the bombing which killed all 259 passengers

aboard the plane and killing an additional 11 individuals on the ground. Of the 259 on board the aircraft 189 were Americans heading back to the United States. It was determined that the bomb had been concealed inside a cassette player that was within the luggage compartment of the aircraft. This disaster remained the single most deadly act of terrorism involving aviation until the events of 9/11 transpired (Federal Bureau of Investigation, 2015a; Shughart II, 2006).

World Trade Center 1993

The first terrorist attack to happen at the World Trade Center took place on February 26, 1993. Muslim terrorists rented a van and loaded it with 1,200 pounds of explosive material and then drove it into the underground parking garage of the World Trade Center. When the bomb finally detonated the result was the deaths of six people and injuring nearly 1,100 people (Mahan & Griset, 2013).

Murrah Federal Building Bombing

At exactly 9:02 a.m. on April 19, 1995 at the Alfred P. Murrah Federal Building in Oklahoma City, Oklahoma, a Ryder truck laden with approximately 3000 pounds of ammonium nitrate and nitro methane detonated. The truck bomb decimated the front of the building killing 168 people to include 19 children who were inside the day care facility located at the federal building and injuring another 500 people. Timothy McVeigh was arrested soon after the attack as the result of a traffic stop and his co-conspirator Terry Nichols was arrested some time later. Both were eventually tried and

convicted and McVeigh was executed in 2001 while Nicholas continues to serve out a life sentence (Federal Bureau of Investigation, 2015g; Shughart II, 2006).

Centennial Olympic Park Bombing

On July 27, 1996, the first of four bombs designed by Eric Rudolph detonated at the Centennial Olympic Park located in Atlanta, Georgia. He was also responsible for three other attacks in the Atlanta and Birmingham areas before finally being caught in 2003 by a police officer in rural North Carolina. In all Rudolph was responsible for the deaths of two people and for injuring at least 100 others (Federal Bureau of Investigation, 2015h; Nacos, 2012).

UNABOMBER

In 1978 Theodore Kaczynski began a nearly 20-year reign of terror from that first bombing in 1978 until his last one in 1995. The Unabomber as he was referred to as a result of the investigative name given to the case of "UNABOM" which referred to universities and airline bombs. Kaczynski's bombs were all very primitive but were effective in killing three people and injuring 23 during the 17-year span. He was finally captured and on January 22, 1998 he pleads guilty in return for a life sentence (Federal Bureau of Investigation, 2015d; Nacos, 2012).

United States Embassies Bombings

Nearly simultaneously on August 7, 1998, the United States embassies in Nairobi, Kenya, and Dar es Saalam, Tanzania were attacked by truck bombs. At the embassy in Kenya later named "KENBOM" 213 died as a result of the bombing and it is estimated

that an additional 4,000 were injured. In Dar es Salaam, Tanzania, the attack on that embassy killed 12 and injured another 85. The Tanzania bombing was later named "TANBOM" (Federal Bureau of Investigation, 2015c; Mahan & Griset, 2013)

Provisional Irish Republican Army (PIRA)

The Provisional Irish Republican Army (PIRA) often used car bombs and vehicle launched mortars as their main methods of attack in the furtherance of their terrorist goals for nearly four decades. The PIRAs modus operandi was to plant car bombs and then warn authorities of the presence of the device so that the area could be evacuated thus causing property damage. On August 15, 1998 in Omaugh located in Northern Ireland a RIPA car bomb exploded and left 29 dead and causing over 200 injuries. As was their practice the PIRA notified authorities but unfortunately evacuees were lead right into the path of the car bomb. The PIRA had believed that people would be lead to the courthouse but were instead lead directly into the market district were the bomb was waiting. After this tragedy, the public opinion toward the PIRA and similar groups turned very negative and PIRA lost most of the local support that they had enjoyed previous to this bombing (Mahan & Griset, 2013).

USS Cole 2000

The USS Cole was moored at the Port of Aden in Yemeni on October 12, 2000. The USS Cole was there to re-fuel and re-supply the Naval Destroyer. During the re-fueling process a small boat laden with explosives detonated when it pulled alongside the ship. This suicide attack created a 40-foot crater in the side of the vessel near the

waterline. This act of terrorism claimed the lives of 17 United States sailors and numerous more suffered serious injuries (Federal Bureau of Investigation, 2015e; Nacos, 2012; Shughart II, 2006).

Shoe Bomber 2001

On the 22nd day of December in 2001, a few short months after 9/11, Richard Reed boarded American Airlines flight 63 from Paris to Miami. During the flight passengers smelled smoked and realized that Reed was attempting to light his own shoes. He was overpowered and restrained and it was later discovered that Reed had improvised explosives inside his shoes (Dickerson, 2007).

British Consulate Bombing 2003

On 20 November 2003 the British Consulate in Istanbul, Turkey was bombed followed shortly by a second bombing of the HSBC bank headquarters also located in Istanbul. The death total numbered 27 with at least 400 people receiving injuries as a direct result of the bombings. This was on the heels of the previous week, in which, two synagogues were attacked leaving 20 people dead (Taviloglu, Yanar, Kavuncu, Ertekin, & Guloglu, 2005).

Madrid Bombings 2004

Fear ripped across Europe on 11 March, 2004. A total of four commuter trains in Madrid Spain were bombed. It was considered as the most devastating act of terror to hit Europe since the downing of Pan Am Flight 103 over Lockerbie in 1988. These attacks resulted in 191 deaths and over 1800 people were injured (Dannenbaum, 2011).

2005 London Bombings

On July 7, 2005, London suffered multiple attacks from Islamic terrorists. The three simultaneous attacks occurred within minutes of each other on three separate underground rail systems and then within an hour of the first set of attacks a fourth suicide bombing occurred on a double decker bus. In all there were 53 deaths and more than 700 injured (Hinkkainen, 2013).

Mumbai Bombings 2008

From November 26-28, 2008, Mumbai, India reeled from multiple attacks that shook that country to its foundation. The group Lashkar-e-Taiba (LeT) started its reign of terror via a maritime assault in the evening of November 26, 2008. Some believe that the Pakistani Inter-Services Intelligence Directorate (ISID) may have been behind the plotting and planning of the attack (Mahan & Griset, 2013). Upon reaching the shore the attackers spread out among the city executing attacks on numerous locations. While this was not solely a bombing campaign per se explosives were used throughout the commando-like operations and is yet another clear indication of just how much terrorist are vested in the use and proliferation of explosives in order to affect their attacks (Rath, 2010).

Underwear Bomber 2009

Christmas 2009 nearly escaped a tragic ending only because a device that was set to function aboard Delta/Northwest Airline Flight 243. The Paris to Detroit flight had aboard it a passenger from Nigeria named Umar Farouk Abdulmutallab, who will forever

be known as the "underwear bomber." While many argue over the missteps of the United States intelligence community few take time to think about what could have happened had the device functioned as designed. Abdulmutallab did carry out his attempt fortunately the improvised detonators and improvised explosives failed to function as designed. While he is currently living out a life sentence we must stop to realize that there would have been a much different narrative of the event had he been successful (Ette, 2012).

Times Square Bombing Attempt 2010

The city that near sleeps did briefly stand still on May 1, 2010 as a Pakistani immigrant named Faisal Shahzad drives his SUV to Times Square in New York City. It was tentative street vendors who thought that his activity was suspicious and became alarmed when they observed smoke coming from the vehicle. Luck was on the side of New Yorkers that busy evening because the bomb failed to detonate and subsequently the NYPD bomb squad approached the vehicle and rendered the vehicle explosively safe. This was yet another attempted attack by a Muslim extremist that was only adverted by the fact that he did not properly construct the device. Shahzad was eventually arrested and is currently serving a life sentence (Haberströh, 2011).

MLK Day Bombing Attempt 2011

On January 17, 2011, a white supremacist named Kevin Harpham placed a bomb that was inside a backpacked along the parade route for the Martin Luther King Day parade in Spokane, Washington. The device, designed to kill or maim parade goers was

discovered and rendered safe before it could detonate. Harpham is currently serving out a 32-year sentence in federal prison (Federal Bureau of Investigation, 2012; Soutern Poverty Law Center, 2011).

Oslo Attack 2011

On July 22, 2011 Anders Behring Breivik, a right-wing Anti-Muslim extremist planted a bomb in the center of government quarter in Oslo killing eight people. Breivik then goes on a shooting attack at a youth camp on Norway's Utoya Island, killing another 69 people, many were teenagers. Following his arrest and during court proceedings it was discovered that his intent was to murder everyone on the island and plant another bomb elsewhere to kill even more people (Wiggen, 2012)

Boston Marathon 2013

April 15, 2013 on the packed streets of Boston, Massachusetts near the finish line of the world-famous Boston Marathon two bombs explode seconds apart. The bombs which were improvised explosive devices contained inside of pressure cookers that were placed within backpacks resulted in the deaths of two people and seriously injuring more than 260 people. Many of those injured suffered that loss of limbs. The pursuit of these individuals resulted in the shooting death of a police officer an exchange of gun fire between the suspects and law enforcement officials were forced to deal with IEDs being thrown out of a moving vehicle at them. One of the suspects, Tamerlan Tsarnaev, was killed in a gun battle with police and his younger brother, Dzhokhar Tsarnaev, was

seriously injured as a result of gunfire but lived to face his day in court and is now waiting on his execution date (Seelye, Goodnough, & Bidgood, 2015; Sylvester, 2014).

Review of Previous Research Comparing Instructional Methods

The review of previous research where instructional methods are compared one to another has met with mixed results (Adamson, 2012; Balch, 2012; Banyen, Viriyavejakul, & Ratanaolarn, 2016; Chang, et al., 2014; Changeiywo, Wambugu, & Wachanga, 2011; Dyer, et al., 2015; Hackathon, Solomon, Blankmeyer, Tennial, & Garczynski, 2011; Hsieh, Dawson, Hofmann, Titus, & Carlin, 2014; Odom & Bell, 2015; Shoulders, Wyatt, & Johnson, 2014). In two studies, Adamson (2012) and Odom and Bell's (2015) both reported when lecture and lecture plus another method were compared no significant difference discovered between the modalities. In Odom and Bell's (2015) study the participants were seven and eight grade students and their age may have been a factor in the result of the study's findings. In Adamson's (2012) study there were only 14 participants and with such a small group I would find it difficult to generalize the results to a larger population. A majority of the previous research found that lecture plus any type of added instructional method improved learning (Balch, 2012; Chang, et al., 2014; Changeiywo, Wambugu, & Wachanga, 2011; Zarmina, Khadija, & Gulshan, 2015). In this review, I was only able to identify a few studies that employed the Solomon four group design and those two met with mixed results (Adamson, 2012; Chang, et al., 2014; Changeiywo, Wambugu, & Wachanga, 2011; Wangila, Martin, & Ronald, 2015) but the one consistency was that four studies were able to determine that there no pretest sensitization existed which once again speaks to the validity of the method and is why it

is often considered the gold standard for testing (Campbell & Stanley, 1963). Among the studies perhaps the most interesting was Shoulders, Wyatt and Johnson (2014) study. Their study was a posttest –posttest method that consisted on one group receiving lecture first and given a posttest then receiving a demonstration followed by an equivalent second posttest. The second groups began with the demonstration then took a posttest first and then were given the lecture followed by the equivalent second posttest. The group that experienced the demonstration followed by lecture scored significantly higher on the posttest, an uncommon approach, than the group that experienced lecture followed by demonstration, the more common approach (Shoulders, Wyatt, & Johnson, 2014). It is clear from this review of literature that not only is more research is required but that the research should be conducted, replicated and repeated to ensure consistency, validity, and reliability.

Summary

The literature review in this chapter has provided an overview of public policy and counterterrorism. It has further provided insight as to how educational theories applied as a multidisciplinary approach to this study helps to close the gap between public policy and training by looking at the application of the appropriate educational theories to ensure the best return on the governments expenditure of resources. The review of the literature has also focused on current literature as it relates to first responders training and preparation and even on a larger scale - homeland security activities. A brief look at the research methodologies and why quantitative research using the Solomon four group design will be the preferred approach was demonstrated. This

review also examined literature from a historical perspective of explosive related acts of terrorism for the past four and a half decades was reviewed. Lastly, a review of similar research and the findings were reviewed to demonstrate the need for additional research. The research methodologies reviewed in the literature provided an in-depth look to the rational for using a quantitative research approach. The same literature further helped to formulate the information needed to develop the research question and provide the basis for the hypothesis construction and the rational for using the Solomon four group design that will be discussed in far greater detail in Chapter 3.

Chapter 3: Research Method

Introduction

I designed this study to determine if a relationship exists between the instructional methodologies used in counterterrorism training to identify the most cost-effective approach for public administrators to employ. In this chapter, I will present and justify the research design used in connection with this study. Additionally, I described the method, population and the justification of the size of the population. I then explain my process for data collection and analysis as well as my role as the researcher. Finally, I describe the ethical considerations in protecting the participants.

Research Design

I used a quantitative design for my study to determine if a relationship existed between the instructional methodologies used in counterterrorism training and the associated level of awareness of the participants as a result of the methodology employed. I selected a quantitative research design because I was trying to determine if a causational relationship existed, or in the words of Moutinho and Hutcheson (2011, p. 12) did "A cause an outcome in B".

I used a classical experimental design, which in referring to Moutinho and Hutcheson (2011) means that experimental control was maintained and participants were randomly assigned to their testing groups In an experimental design, there must be at least two groups; one receives a treatment or a condition and the other does not as a means of comparison for a causal relationship (Moutinho & Hutcheson, 2011).

This research design provided empirical data that will assist public administrators in determining which educational methodologies provide for a greater return on investment of public funds in the protection of the nation. The specific research design that I employed was the Solomon four group design.

The Solomon four group design is among the most stringent of the quantitative research designs (Braver & Braver, 1988; Campbell & Stanley, 1963; LavanyaKumari, 2013; McGahee & Tingen, 2009; Weinrich, et al., 2007). The Solomon four group design is considered stringent because it is the one method that combines a pretest and a posttest to discover if the participants have been sensitized by the pretest, thus affecting the posttest score, or if the pretest prepared the participant for the posttest.

One of negatives of the Solomon four group design is that no one single test exists that is capable of providing the researcher with all of the necessary results to explain if a relationship exists. For this reason, multiple datasets must be calculated to explain the relationships of the four groups. Another reason most researchers choose not to use the Solomon four group design is that it requires a significantly larger number of participants than what most other quantitative designs require.

I selected this research design to determine if there is a statistically significant difference in the level of awareness of the participants. In my study, participants were randomly assigned to one of four groups. One control group and one experimental group were administered a pretest. Then all participants were exposed to approximately three hours of lecture. At the conclusion of the lecture, the two control groups took a posttest. After the testing was complete, all participants were exposed to a live explosive

demonstration, which in this case was the experimental treatment. The explosive demonstration could also be considered the participants' reward, in that, the explosive demonstration was the main draw for most participants. At the conclusion of the explosive demonstration, the two experimental groups were administered the posttest. The objective was to see if there existed a statistically significant difference in the score of the control groups when compared to the experiment groups in determining if participants obtain a greater level of awareness as a result of the demonstration that helps to engage multiple human senses.

The program that I studied was the FBI's NIEF/CIOW, and as such, the study had to be conducted in the most nonintrusive fashion. To ensure a minimum intrusion and to ensure that participation in the study was truly voluntary and ethical, a fifth group served as a nontesting group. This fifth group was important, in that those who opted-out of the study still had the opportunity to receive the training. This was significant because those after reading the informed consent who opted in were true volunteers; yet, those who opted out were still able to attend and thus did not interfere with the FBI's outreach mission.

The method for ensuring a random selection was to have those participants that opted in to the study draw a small yellow card with a single fold. Each card had the letters A, B, C or D and was placed in a container. As each participant executed the informed consent that participant then drew a card from the container and that was their group assignment. Each participant had an equal chance of being assigned to any of the four groups.

Role of the Researcher

I gained approval from the FBI IRB (375-16 Exemption Order Approval) on September 15, 2016. Walden IRB approval (11-14-16-0364599) was granted on November 14, 2016. I contacted FBI WMD Coordinators and SABTs to identify testing locations.

I conducted my pilot study in West Palm Beach, Florida on January 30, 2017. After my pilot study, I conducted the remainder of the testing in the following locations: Huntsville, Alabama; Long Island, New York; Mt. Laurel, New Jersey; Springfield, Illinois; Richmond, Virginia; and West Boylston, Massachusetts. In total, the above accounted for one pilot and nine regular study locations throughout the United States over a 6-month period. It should be noted that I am a public safety bomb technician with nearly 18 years of experience and well over 20 years of law enforcement experience and military experience.

Research Questions

The research questions for this study were:

1. Is there a statistically significant difference in adult learning that takes place between counterterrorism awareness training that is lecture based only compared to counterterrorism awareness training that involves both lecture and a demonstration?

2. Is there a correlation between instructional methodologies used in counterterrorism training and the government's return on investment?

Hypotheses

H_0: There is no statistically significant different in counterterrorism awareness of adult learners in the lecture only method compared to the lecture and demonstration method.

H_1 There is a statistically significant difference in counterterrorism awareness of adult learners between the lecture only and the lecture and demonstration approach.

Population and Sample

The target population of this study was first responders, public and private security, and industry leaders and executives. In defining these groups, the term *first responders* include police, firefighters, and emergency medical personnel, which includes, but is not limited to, emergency medical technicians (EMTs), medical doctors, licensed practical or registered nurses, and physician assistants and/or nurse practitioners. Public and private security includes such facilities as the Strategic Petroleum Reserve (SPR) which is a public facility that is considered a critical infrastructure operated with public funds or a facility like DuPont, which has facilities that are considered to be critical infrastructures and are operated with private funds.

The leaders and executive level participants from industry could range from critical infrastructure facilities previously noted or those that operate such locations as Sally's Beauty Supplies, Home Depot, or other like businesses that sell products that

have legitimate commercial products for sale that could also be used by terrorists as precursors in constructing improvised explosives.

Research Instruments and Procedures

The research instruments for this quantitative study were multiple choice written examinations. The pretests contained the same questions as the posttests; however, the questions were presented in a different order to ensure that those participants who were administered the pretest were not able to simply memorize the answers for the posttests. In order to ensure anonymity of the participants no names were collected on the tests themselves. The only place that contained a participant's name was on the informed consent. Nothing on the informed consent linked the participant to their tests scores I did however want to ensure that the test or tests could be linked to a participant.

As noted earlier, when an individual opted-in to the study, that person would draw a card that contained the letter A, B, C or D. The participant would then receive a lanyard with a participant identification card. The participant card would have an alpha and numeric code. Below the alpha-numeric code there was a code 39 bar code. The naming convention for the participant cards were for instance: A_0001…, B_0001…, C_0001…, or D_0001…. In addition to the participant card each test was coded; Pretest Groups A and B were coded as PRAB0001…; Posttest B and D would have a code of POBD0001…; and Posttest A and C would have a code of POAC0001… and each also contained a code 39 bar code under each sequential coded test.

The designation for Group A was an experimental group with a pretest and a posttest following the explosive demonstration. Group B was a control group with a pretest and a posttest following the lecture. Group C were an experimental group with a posttest only following the explosive demonstration. And Group D was a control group with a posttest only following the lecture. My tests were all color coded and the participants received participant cards so that I could ensure that participants had received the correct test at the correct time. The Group A participant cards had a blue dot in the lower left corner representing that the participant was to take a pretest and there was also a red dot in the lower right corner representing that the participant would receive a posttest following the explosive demonstration. Group B participant cards had a blue dot in the lower left corner representing that the participant was to take a pretest and there was also a green dot in the lower right corner representing that the participant would receive a posttest following the lecture. Group C participant cards had a red dot in the lower right corner representing that the participant would receive a posttest following the explosive demonstration. Lastly, Group D participant cards had a green dot in the lower right corner representing that a participant would receive a posttest following the lecture.

The tests contained the colored dots as well. The pretests contained a blue dot at the top of the first page in the center. The posttests following lecture had a green dot located in the top center of the test and the posttests following the explosive demonstration had a red dot located in the same position. I used the Home Library Organizer to scan the participant cards and the tests to link the tests. As an added

precaution, I included the participant number in the upper right-hand corner of the tests to ensure that the tests and participants were linked.

Attached to the back of each posttest was a biographical inventory to further the research in terms of determining if the participant's level of awareness and instructional methodology differed based upon, age, race, sex, education, vocation, or by region. This was an added dimension that provided interesting and informative results that has bearing not only on the results of this study but could be used as a basis for future research as well.

I also used an excel spreadsheet to identify when a participant card was issued; for example, when B_0043 was issued and at what testing location all of which was placed into SPSS. All of the above allowed me the ability to fully document in SPSS and to provide redundancies to ensure that participants and tests were all accounted for thus ensuring no loss of information.

Quantitative Data Collection

The quantitative data collection was executed through written multiple-choice examinations, which were used to determine if a causal relationship existed between the variables. Quantitative studies are similar to a snapshot of time in history. Quantitative studies serve as a basis for generalizing the results to the greater population or ensuring that there is external validity. In addition to internal validity all of which demonstrates that strength of the casual relationship of the affect that the independent variable has on the dependent variable (Braver & Braver, 1988; Campbell & Stanley, 1963; Frankfort-Nachmias & Nachmias, 2008).

I derived the written multiple-choice examination questions from the NIEF/CIOW curriculum's Terminal Learning Objectives (TLO). TLOs are the main learning points that should result in the participants gaining a greater level of awareness as a result of attending the training.

Validity

In constructing the testing instrument, I consulted with the core faculty at the Hazardous Devices School (HDS). The HDS is the sole public safety bomb technician school in the United States. The core faculty at HDS is either retired military or public safety bomb technicians with over 20 years of explosives and teaching experience. This peer review helped to ensure that the testable material was prepared logically and would accurately determine if a change in the level of awareness could be determined. I also be sought the assistance of subject matter experts from within the FBI who are intimately familiar with the NIEF/CIOW to ensure that the testing instrument questions were truly representative of the NIEF/CIOW objectives.

The Solomon four group design is excellent for ensuring both internal and external validity. Using this method of the four separate groups the validity is demonstrated through the use of the pretests to identify the level of awareness prior to the training of both a control and experimental groups. In the case of this study the control groups took a posttest after the lecture. This provided us with two forms of information the first being is any level of awareness occurred from lecture only and the second form of information was used to compare the results to those of the experimental groups. The experimental groups were administered the posttests after observing the explosive

demonstration, which for the purpose of this study was the treatment, and the results are being used to not only determine if there was a greater level of awareness but was there a greater level of awareness when compared to the control group who were tested after the lecture. Internal validity would be enhanced in this study if I was able to secure 385 or more participants and randomly assign them to the testing groups; I was able to secure a total of 412. A group this size in its totality provides probabilistic equivalency to verify if the casual effects of x did or did not result in y (Campbell & Stanley, 1963). I believe that the fact that my study did have equivalent groups at each location and each location itself can be studied individually. The tests are repeatable and answers from this study can be applied to other people at other times in other places (Campbell & Stanley, 1963). The results did consistently show across testing locations and demonstrated external validity which also strengthens my internal validity.

Reliability

The reliability of my study or the ability to ensure the consistency of measuring my test, I began my research with a pilot study. The pilot (described below) helped me ensure that the testing measures are consistent. Additionally, because I conducted testing at several locations over time and each of which will test all four groups as an individual location identified regionally lends itself to the ability to demonstrate its ability to be tested and retested. These two factors will serve to provide adequate reliability of this study (Roberts, Priest, & Traynor, 2006).

Survey Variables and Scales

The survey variables for this quantitative study included one independent variable, a dependent variable and the controlling variables. The independent variable was the introduction of an explosive demonstration following classroom lecture. For this experimental study, the independent variable served as the treatment. The dependent variable was the participants' level of awareness to determine if a change existed as a result of the treatment. Lastly, the controlling variables were the participants themselves which included first responders (police, fire, and EMS), private/public security, and industry leaders.

The scales of this study were conducted at the ratio level, in that, the testing instruments the pretests and posttests are each based upon a 100-point scale. The tests were a 25-question examination with the value for each question of four points per correct answer. The median of the control group ratios of the tests scores will be compared to the experimental group ratios of the tests scores to determine if there exists a difference in the level of awareness.

Raw Data

The raw data collected will be maintained on my personal computer and as a back-up will also be maintained on the my personal home cloud. My computer is password protected and the cloud is not only password protected but linked only to my computer. The data from the pretests and posttests will not contain any personal identifiable information but will contain biographical inventories. For this reason, the information will be maintained in a security filing cabinet at my home office. This is also

where the informed consent forms will be maintained and secured. All such sensitive information will be maintained for a period of five years from the completion of the study. At the expiration of the five years period I will ensure that the documentation is properly and destroyed.

Pilot Study

My pilot study was conducted after I had obtained IRB approval from both the FBI and from Walden University. My pilot study was held in West Palm Beach Florida on January 30, 2017 and included a total of 37 participants. The results of the pilot and the main study will be discussed in Chapter 4.

Setting

The setting for this study was held at several locations throughout the United States. Each testing location was scheduled through the FBI's WMD Directorate in consultation with local FBI Field Offices. As stated previously the pilot study took place in West Palm Beach, Florida, and that, in total ten different venues were used for the main study over seven different states.

The following criterion was required to be established to secure as a testing location:

First, the location must have an indoor classroom area reasonably close to the selected demolition/demonstration range. The reason the classroom must be close or to have one close is that it is highly doubtful any experimental group will return to a classroom to take a posttest after they have seen the demonstration if it were to require

them to drive a distance back to a location at their own time and expense. While the classroom portion can and may be conducted at another location the experimental groups must have a testing room within a reasonable distance of the demonstration range. This will be the most difficult part of the setting selection criteria. One of the first points that became clear as a result of the pilot study was that this requirement was going to eliminate almost all of the possible testing locations. To remedy this, I purchased a large quantity of clip boards and passed them out with the tests thus opening making it far easier to identify testing locations.

Second, the demonstration range must have at least 100 yards (300 feet) separation between the observers' location and the explosives. This was the easiest aspect to ensure because FBI internal protocols require that safety margin for all ranges. The safety factor was a concern but one that was mitigated by the FBI as a common practice.

Lastly, the settings were located in area with those FBI field offices that would allow for the study. Although the FBI's WMD Directorate funds the training and supports the study, each individual field office has the right to allow or to decline being a testing location. It was to my delight that a majority of the FBI Field Offices were very welcoming to being a testing location, in fact, many of the field offices wanted to participate but the dates were beyond the timeline that I was trying to complete the study.

The number of settings locations turned out to be eleven including the pilot. The number of participants fluctuated greatly from one location to the next. The smallest was approximately 43 attendees and the largest was 115 attendees. Most of the locations with

a smaller number of attendees tended to have greater levels of participation from attendee than the larger venues.

Sample and Selection Criteria

The estimate of the size of the population was extremely difficult if not impossible to estimate. The best that I have been able to estimate is that according to the Uniform Crime Report as of 2010 there were 705,009 law enforcement officials in the United States (Federal Bureau of Investigation, 2010b). The Federal Emergency Management Agency (FEMA) (2012) reported that there were 1,190,000 firefighters in the United States. The National Registry of Emergency Medical Technicians (NREMT) (2012) estimate was that in the United States there were approximately 376,824. The one point that is problematic with this group is that the previous number also includes many law enforcement personnel, firefighters, and security personnel. Unfortunately, there are no mechanisms to separate those with dual-roles, which leave me with a slightly higher population estimate. A more difficult task is estimating how many security personnel exist in the United States. The best estimate as of 2012 was 1,083,600 (United States Department of Labor, 2012), but this too is problematic because this number includes all types of security personnel not just those who protect critical infrastructures. The last population group is yet again difficult if not impossible to determine and that is the number of industry executives in the United States. For example, there are over 8,000 chemical plants (SelectUSA, 2014) alone in the United States not including other critical infrastructures. A rough estimate of the total population is 3 million individuals as a population.

Using a confidence level of 95% and having a confidence interval of five for a total combined population of approximately 3 million, I needed a sample size of 385 participants (Raosoft, 2004). I was able to obtain 412 participants so my results should be generalized to the total population of the eclectic group of first responders, security and industry personnel.

Recruitment of Participants

The recruitment of the participants was via the FBI's WMD Coordinators from the FBI field offices selected as testing locations. The WMD Coordinators' role in support of the NIEF/CIOW was to seek out people and organizations that meet the criteria of first responders, private and public security, and industry/commercial managers. The WMD Coordinators reached out to these people and groups as they traditionally do but for the sake of the study notified the potential participants that a research study was being conducted and that participants are asked to participate; however, the WMD Coordinators also made the potential participants aware that their ability to attend the training was not contingent on their participation in the study. The notice delivered by the WMD Coordinators will serve two purposes first to ensure that the FBI's mission was not harmed by the conduct of the study and the second reason was to ensure that participation in the study is truly voluntary.

The WMD Coordinators normally have participants R.S.V.P. their attendance; however, at times those who have not R.S.V.P are often allowed to attend as long as it can be verified that they are members of one of the above noted groups. It is for this reason that the informed consent was not be issued until potential participants arrived.

After receiving informed consent, those participants who chose to opt-in reached into a bowl and randomly draw a ticket from the bowl. As stated earlier, the tickets were labeled A, B, C, or D to signify their assigned group and each participant had an equal chance of pulling any of the four letters from the bowl thus providing adequate randomization to be a true experimental design. Those that drew the letter "A" served as the experimental group with pre-test. Those who drew the letter "B" were the control group with pre-test. The participants that drew the letter "C" were the experimental group that did not have a pre-test. Then there were those participants who drew the letter "D" served as the control group with no pre-test. The rest served as a non-testing group. The non-testing group was for those who opted-out of the study or for those who are currently certified public safety or military bomb technicians. The bomb technicians were placed into the non-testing groups so as to eliminate out-layers because bomb technicians should score significantly higher than all other participants and would skew the mean scores. Considering the recruitment above I was able to guarantee that the FBI's mission remained intact and that participation in the study was a voluntary one by allowing those who opted-out to still receive the training.

Limitations

There were a couple of limitations to this study. One of the limitations included the participants' reactions while taking the pretests and the posttests. One of the greatest limitations to overcome was in getting the participants to take the testing seriously. While they may have agreed to their participation in the study and the tests themselves should take the average participant only 10-15 minutes to complete, I am still concerned that

many answered the multiple-choice questions quickly without reading or considering what the correct responses were. One reason that I believe this issue may have arisen is because the tests are not attributional (anonymous) beyond a generated participant number, the participant has nothing to lose by quickly filling out the responses without thoughtful consideration. I believe that this was even more so an issue for the experimental groups because the treatment and the reward are one in the same there is no incentive to put for their best effort. In contrast, the control groups who took the posttest before seeing the demonstration (i.e. the treatment) were likely to try hard because their remains the excitement of still receiving the reward, which is observing the explosive demonstration.

While this was a serious limitation, the only proactive measure was to continually reiterate to the participants that they were encouraged to do their best on all of the tests. This limitation will remain as an unknown even after the results of the study are completed because we can only speculate unless we were able to ask the participants and we cannot because of anonymity. Another limitation existed in the randomization of the test groups. Due to the method that I selected of having the participants to reach into a bowl and selecting a pre-printed group assignment there does exist the possibility of the group numbers being significantly different in portion to one another. Although doubtful the potential exists that, for example, that no one pulls a “D” from the bowl thus not having any or only a few posttests only control group. I did my best to remedy this by trying to have an equal number of each letter as close to the established number of participants. For example, if we expected 50 people to attend I would put an equal

number of letter thus in this example of 13 thus making the number 52. This however, is not full-proof because if all 50 participate then there will be one or two more of a couple of the groups. If less than all 50, which was the usual case, participate then some of the groups may seriously be under-represented. I do believe that this was still the most prudent course of action and I would do it the same way again if I had to repeat the study. When all of the results came in, as stated before there were 412 participants in total and it turned out that the number ended up being four equal groups with the count of 103 participants per letter group.

Data Analysis

The data analysis for this study is fairly straight forward. This quantitative study used multiple choice pretests and posttests. As noted earlier the test instruments were developed by the researcher and did involve a peer-review process. The researcher did conduct one small pilot study involving 37 participants to determine whether the tests appropriately gathered the desired information. The instruments did adequately capture the information. I then conducted the remainder of the study with the goal of collecting at least 385 participants and in the end actually collecting 412 participants.

Analysis of Quantitative Data

The analysis of the quantitative data was conducted in such a manner as to compare the results in the following manner. As a traditionally seen in Solomon four group design experiments there are a total of six observations. The first observation is that of the experimental group with a pretest and the second observation is the posttest

after treatment. This is designed to see if the results are greater for observation two than the results of observation one (Campbell & Stanley, 1963). The next set of observations is observation three, which is a control with a pretest and the fourth observation is the control group posttest without treatment (Campbell & Stanley, 1963). Observation four is followed by observation five, which is the other experimental group who did not take a pretest but are observed taking the posttest after having received the treatment (Campbell & Stanley, 1963). Lastly, is observation six, which is that of the final control group which did not take a pretest and did not receive a treatment but did take a posttest (Campbell & Stanley, 1963). This is graphically demonstrated in Figure 1.

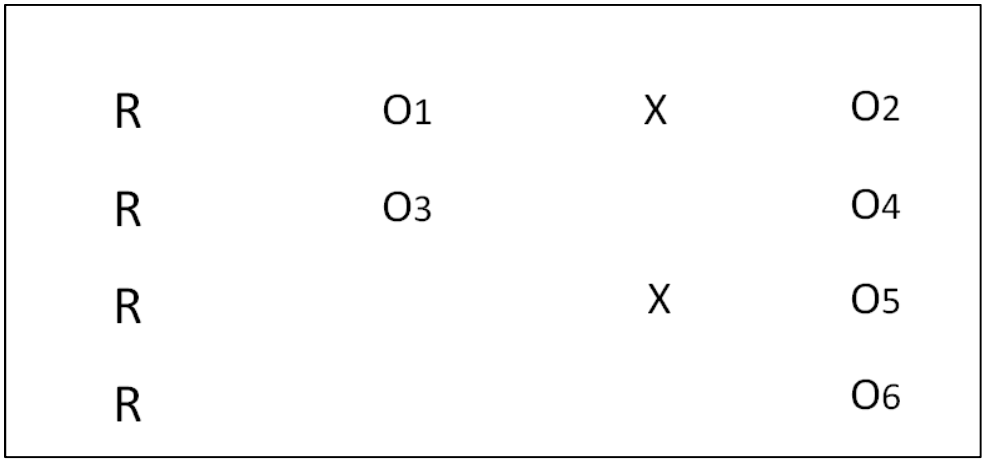

Figure 1. *Traditionally seen Solomon four-group design*

This study is a slight adaptation of the of the original Solomon four-group design, in that, the observations are located in the same fashion; however, all participants receive a partial treatment of the lecture because the purpose of this study seeks to see if there is a difference of lecture only compared to lecture and the explosive demonstration. For this

reason, the two groups that took the pretests do so before the lecture. This affords the researcher the opportunity to not only see if there exists pretest sensitizing but this way there is the opportunity to also see the level of awareness as a result of the lecture only and the lecture compared to the lecture plus demonstration combination. Additionally, what makes this study slightly different is that all groups receive the treatment but the control groups take the posttests before receiving the treatment and the experimental groups as is normal take the posttest after receiving the treatment. The reason for doing so is two-fold. First, as noted earlier the program being studied is an active FBI program and requires that everyone have the opportunity to delight in the full experience. The second reason is because most participants show up to the study because they, as most people who are not bomb technicians, seldom if ever has the opportunity to watch things blow-up, which in essence brings the child out in all of us because we want to have that experience. This too is graphically depicted in Figure 2.

The data collected from the various testing locations the data were analyzed by using SPSS. In using SPSS, I was able to use the data to identify the mean score for each group. The pre-tests were used to provide a baseline pre-course mean for which to compare against the posttests to determine if pretest sensitization was taking place. To make such a determination I used an ANCOVA to discover if pretest sensitization was taking place. Next, I compared the means via a GLM univariate analysis to determine if there exists a statistically significant difference between the control and experimental groups as a result of the treatment, which in this study was the introduction of the explosive demonstration. Lastly, I used paired *t* tests to determine if there was a

measurable difference in the level of awareness of the participants. The pretests were used to compare against the posttests to determine if there exists a difference in the level of awareness for each the control and experimental groups.

Informed Consent

The informed consent was provided to each attendee shortly after arrival at the study location. After providing a copy of the informed consent, I explained the informed consent and the purpose of the research being conducted in tandem with the course. It was made clear that participation in the study was not required in order to participate in the training, thus ensuring that participation was voluntary.

The informed consent was not distributed ahead of the start of the training because while the FBI makes an effort to get participants to R.S.V.P. often time participants show up at the training without R.S.V.P. and I wanted to ensure that they were notified and willing to participate in the study. Additionally, the invitations to the training evolutions are often sent to executives and word of the study may not have reached the actual participants. I personally verified each persons' participation by observing their written acknowledgement before they participated. Beyond the participants' signatures no other personal identifiable information was collected from the participants. All identify able information was scanned to my personal password protected laptop and to my personal in-house cloud. These records will be securely retained for a period of not less than and no more than five years from the publication of the results of this study.

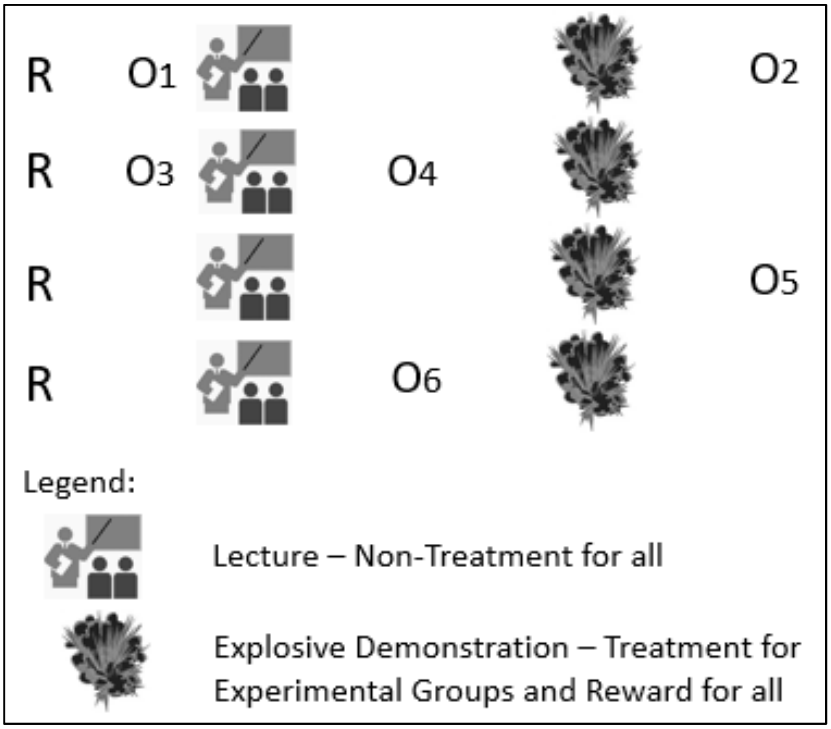

Figure 2. *This study's Solomon four-group design*

Summary

This experimental design study seeks to determine if a relationship exists in the level of awareness gained from counterterrorism awareness training that involves both lecture and a physical demonstration when compared to awareness training that is solely lecture based. The research design described in this chapter has been presented in a logical fashion so as to justify the researcher's choice of design. The sample size, methods, selection criteria and the population were all described above. Additionally, the role of the researcher was described as well as how the quantitative data will be collected, analyzed, retained and evaluated. Lastly, informed consent and all ethical considers

specifically their privacy concerns and their physical and mental welfare of the participants were addressed. In Chapter 4, a detailed discussion that pertains to the pilot study and the main study will be discussed and the results will be fully explored.

Chapter 4: Results

Introduction

In this chapter, I will present the quantitative data collection. The data collection for this studied was used to determine if lecture versus lecture with the addition of another educational modality resulted in a statistically significant difference in the level of awareness in the learners who attended counterterrorism training. The results were statistically nonsignificant; however, they are significant in relation to their ability to provide public administrators with an avenue to determine the cost-effectiveness of publicly funded training.

I sought to identify the most cost-effective means for conducting counterterrorism training. I sought to answer one hypothesis and two research questions in this study. The research questions for this study were:

R1. Is there a statistically significant difference in adult learning that takes place between counterterrorism awareness training that is lecture based only compared to counterterrorism awareness training that involves both lecture and a demonstration?

R2. Is there a correlation between instructional methodologies used in counterterrorism training and the government's return on investment?

The Hypotheses was:

H_0: There is no statistically significant different in counterterrorism awareness of adult learners in the lecture only method compared to the lecture and demonstration method.

H_1: There is a statistically significant difference in counterterrorism awareness of adult learners between the lecture only and the lecture and demonstration approach.

Following is an overview of the pilot study and its impact on the main study. After a description of the pilot study, I will describe the data collection, including the time frame, dates, the recruitment, and the participation rate. I will then move into the explanation of the results of this study. The chapter will conclude with a brief summary of the chapter. My will address the conclusions, recommendations, and the implications for social change based upon the results below in the next chapter.

Pilot Study

Walden University provided IRB approval on November 14, 2016; however, I was not able to conduct the pilot study until January 30, 2017. There were several reasons for this delay, none of which I could overcome. The first obstacle was the approaching holidays. Due to the holiday season, the FBI was not conducting the NIEF/CIOW training, so I had to wait until after the first of the new calendar year. I was further delayed because the federal government was under a continuing funding resolution and until some appropriations were released no training could be scheduled. The last obstacle was both my family members and I had medical issues that would have prevented the beginning of my research even if the other two obstacles did not exist.

On January 30, 2017, I was able to complete my pilot study in West Palm Beach, Florida. There were 47 attendees to the training, of which 41agreed to participate in the study but only 37 actually participated fully.

I learned some valuable lessons that helped to provide significant improvements to the way I conducted the final study. One of the first things I found that I need to change was how I read the informed consent and how I offered possible participants to opt-in. The way I executed both of these tasks in West Palm Beach was very disorganized. I stood in the hallway and attempted to speak to each potential participant and in the process tried to gain their compliance, execute the informed consent, have them draw their number, issue the appropriate group lanyard, and provide them with a pencil and a pretest if they drew groups A or B. This created a bottle-neck, agitated potential participants and the organizers of the event, and was difficult for me to control on without help.

What I learned from that was that I had to make the following changes. I first realized that I had to recruit help. I quickly realized that I could not complete this alone and; for all but one location, my wife traveled with me. At the one event she could not attend, I brought a friend to assist. This was a financially costly that more than doubled my cost, but was well worth the additional expense in terms of ease and organization.

The next change was that I had the host introduce me after everyone was seated. People were more relaxed when I was introduced, passing out the informed consent forms and explaining the study, opposed to being stopped in the hallway. After being introduced and explaining the informed consent to everyone, I would then go to each

individual and ask them for their participation. If they opted not to participate, they were thanked for their consideration and would I move to the next person. For those that opted-in, I would ask them to execute the consent and draw a card from the box I had. As I moved to the next person those assisting me would collect the consent form and provide the appropriate group lanyard and hand out pretests to those that needed them. These changes streamlined the process and lead to a successful conclusion of the pilot study.

Pilot Study Results

The results of the pilot study were such a small number that I cannot generalize to the larger population; however, the results of the pilot were consistent with the final study results. As noted earlier, my pilot study had an N=37. Initially more participants had opted-in but one fact that proved consist with both the pilot and the final study was with people not completing the tests. This primarily happened with experimental groups A and C. There were several occasions were a participants in those group C did not take the posttest, so numbers were lost as a result. Additionally, several participants in group A took the pretest but not the posttest. So, I was left with no choice but to throw out their pretests thus leaving a total of 37 fully completed participants. The same happened at most testing locations.

The data collected from the pilot study were entered into SPSS version 23 and the first analysis was in using a GLM univariate ANCOVA to determine if there existed any signs of pretest sensitization. The results were F (1,19) = .194, p = .665, η_p^2 = .011, which represents that it was nonsignificant and no pretest sensitization existed, which is displayed in Table 1.

The next test was GLM univariate to determine if a significant difference took place between control and experimental groups. For this test, the dependent variable was the posttest means of a pairwise comparison of the control group compared to that of the experimental group. There were 19 control participants (M = 77.68, SD = 10.69, 95% CI = 72.53, 82.84) and 18 experimental participants (M = 77.33, SD = 9.10, 95% CI = 72.81, 81.86) who were compared. The outcome of the variables was considered to be normally distributed and equal variance are assumed based upon the results of the Levene's test (F (35) = .870, p = .357). The GLM univariate was used to determine if there was a statistically significant difference between the level of awareness between those who received lecture only and those who received both the lecture and the explosive demonstration. The results were F (1, 36) = .011, p = .915, η_p^2 = .000, which is nonsignificant and means that the null hypothesis failed to be rejected and is demonstrated in Table 2.

While there was a nonsignificant difference between posttest results, a paired samples t-test comparing posttests to pretests to determine if there was a gain in scores was found to be significant. The pretest (M = 58.60, SD = 11.04) compared to the posttest mean of (M = 78.40, SD = 11.19). While it did fail to demonstrate a significant correlation, there was a significant average difference between posttest and pretest scores t (19) =6.708, $p < 0.001$, d = 1.5, which is a large effect. On average posttest scores were 19 points higher than pretest scores (95% CI [13.622, 25.978]) Table 3. The significance of this finding is that while I was not able to prove an increased level of awareness with the addition of the explosive demonstration this does demonstrate that the participants'

level of awareness was increased at minimum as a result of the lecture. This is important because it does demonstrate that the program is increase participants level of awareness.

Table 1

Results from ANCOVA (N=20) DV posttest for both groups pilot study

Source	Type III Sum of Squares	*df*	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	224.837[a]	2	112.419	.914	.420	.097
Intercept	2531.381	1	2531.381	20.571	.000	.548
Pretest	173.637	1	173.637	1.411	.251	.077
Cntl_Exp	23.828	1	23.828	.194	.665	.011
Error	2091.963	17	123.057			
Total	125248.000	20				
Total Corrected	2318.800	19				

a. R Squared = .097 (Adjusted R Squared = .009)

Table 2.

Results from univariate ANOVA (N-37) DV posttest for both groups pilot study

Source	Type III Sum of Squares	*df*	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1.138[a]	1	1.138	.011	.915	.000
Intercept	222119.192	1	222119.192	2242.913	.000	.985
Cntl_Exp	1.138	1	1.138	.011	.915	.000
Error	3466.105	35	99.032			
Total	225776.000	37				
Total Corrected	3467.243	36				

a. R Squared = .000 (Adjusted R Squared = .028)

Table 3.

Results from paired t-test (N=20) gain score from pretests to posttests pilot study

	Pair Differences							
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	*t*	*df*	Sig.(Two-tailed)
Pair 1 Posttest Score – Pretest Score	19.8	13.2	2.95	13.62	25.98	6.71	19	.000

Data Collection

The data collection following the pilot study in January 2017 began with a local study location in Huntsville, Alabama on February 22, 2017. At this study location, the training was hosted by the FBI's Weapons of Mass Destruction Directorate (WMDD). There were a fairly significant number of attendees--approximately 60-- but the WMDD was able to determine in advance that all but 16 attendees were either bomb technicians or were foreign nationals who did not have command of the English language sufficient to participate. From the 16 remaining individuals available, 14 opted into the study for a participation rate of 87.5%.

On March 7, 2017, the WMDD hosted another training at the same location with a similar sized group and circumstances. This time the number was slightly higher, with 20 people who met the testing criteria; of the 20 eligible attendees, 16 opted into the study for a participation rate of 80%.

Following the two Huntsville locations I traveled to Westbury, New York to conduct more data collection. This location was hosted by the FBI New York Field

Office on March 22, 2017 and there were 63 attendees, of which 59 opted into the study for a participation rate of 93.7%.

From the New York area, I traveled to Mount Laurel, New Jersey to conduct my next set of data collection on March 28, 2017 and the FBI Newark Field Office hosted this location. This was the largest crowd with 115 in attendance. I thought that this was going to be a windfall day, but I soon realized that only slightly over 50% were willing to participate. From the 115, 70 people completed the informed consent, but only 65 agreed to participate. Of the 65 who agreed to participate only 58 actually took the test or tests for a participation rate of 50.4%. The next two study locations were both held in Springfield, Illinois and were hosted by FBI Springfield Field Office. The first of the two was on April 7, 2017, and there were 76 attendees of which 63 opted into the study for a participation rate of 82.9%. The second Springfield study was held on April 21, 2017 and only had 52 in attendance but I was still able to get 41 attendees to opt in to the study for a participation rate of 78.8%. The next location was in Richmond, Virginia and was hosted by the FBI Richmond Field Office. I originally expected 150 attendees but only 43 people actually attended but of the 43 people in attendance 42 opted into the study for a participation rate of 97.7%. My final two study locations were both held in West Boylston, Massachusetts and were hosted by the FBI Boston Field Office. They were held on two back to back days May 8 and 9, 2017. On May 8, 2017, there were 70 people who R.S.V.P. but only 38 people attended. Of the 38 who attended 36 opted into the study for a participation rate of 94.7%. On the second day May 9, 2017, I was still short of my required numbers and FBI Boston only had 60 R.S.V.P. for that day which even if

everyone participated would have put me just shy of the number I need to complete my study. To my surprise 86 people attended the study of which 83 opted into the study with a participation rate of 96.5%. I was able to finish my data collection with a total of 412 samples collected from February 22, 2017 through May 9, 2017. In all there were 509 people who attended the study of which 412 opted in and completed all test or tests for an $N = 412$ and an overall participation rate of 80.9%.

Descriptors of Participants and Demographics

The participants for this study came from a broad cross-section when one considers gender, race, age, education level, career field and from multiple locations. In this study males accounted for 86% of the participants. The average age of the participants was from 41 to 48 years of age accounting for 28% of the age total. 85% of the participants considered themselves Caucasians and 39% of the participants held bachelor degrees. From the various career fields 48% of the participants were police officers. The above mentioned are the largest group for each category. A comprehensive overview of all demographical information can be located in Tables 4-6 and Figure 3. Looking at the demographics, I believe that I am able to generalize my results to the greater population of my study. I believe that based upon the G*Power analysis I conducted prior to the beginning of the study which for the Solomon four group design had an $N= 385$ to adequately generalize to the population I was study and in the end, I completed my study with an $N= 412$. I have met that standard. I further believe that it is able to generalized because the population itself was consistent with the demographic which I was testing and those that did not meet the criteria were excluded from the testing

portions. Now that I have discussed the descriptors and demographics of the participants I will turn toward the discussion of the testing process and the results in the next section.

Table 4. *Test demographics of final study (N=412)*

Characteristic		*n*	P
Gender			
	Male	355	.86
	Female	53	.13
	No Response	4	.01
Age			
	18-25	15	.04
	26-32	71	.17
	33-40	100	.24
	41-48	115	.28
	49-56	60	.15
	57+	47	.11
	No Response	4	.01
Ethnicity			
	Caucasian	351	.85
	African-American	26	.06
	Hispanic	21	.05
	Asian	5	.01
	Native-American	4	.01
	Middle Eastern	2	.01
	No Response	3	.01
Education Level			
	No Degree	2	.01
	High School/GED	29	.07
	Some College	79	.19
	Associates	65	.16
	Bachelors	162	.39
	Masters	60	.14
	Doctorate	13	.03
	No Response	2	.01

Table 5. *Career field distribution final study (N=412)*

Career Field	*n*	P
Police	198	.48
Fire	73	.18
EMS	7	.02
Other Medical	6	.01
Public Security	28	.07
Private Security	13	.04
Industry Leader	6	.01
Industry Executive	6	.01
Other Career	69	.17
No Response	6	.01

Table 6. *Testing locations final study (N=412)*

Location	*n*	P
Huntsville, AL #1	14	.04
Huntsville, AL #2	16	.04
Westbury, NY	59	.14
Mt. Laurel, NJ	58	.14
Springfield, IL #1	63	.15
Springfield, IL #2	41	.10
Richmond, VA	42	.10
West Boylston, MA #1	36	.09
West Boylston, MA #2	83	.20

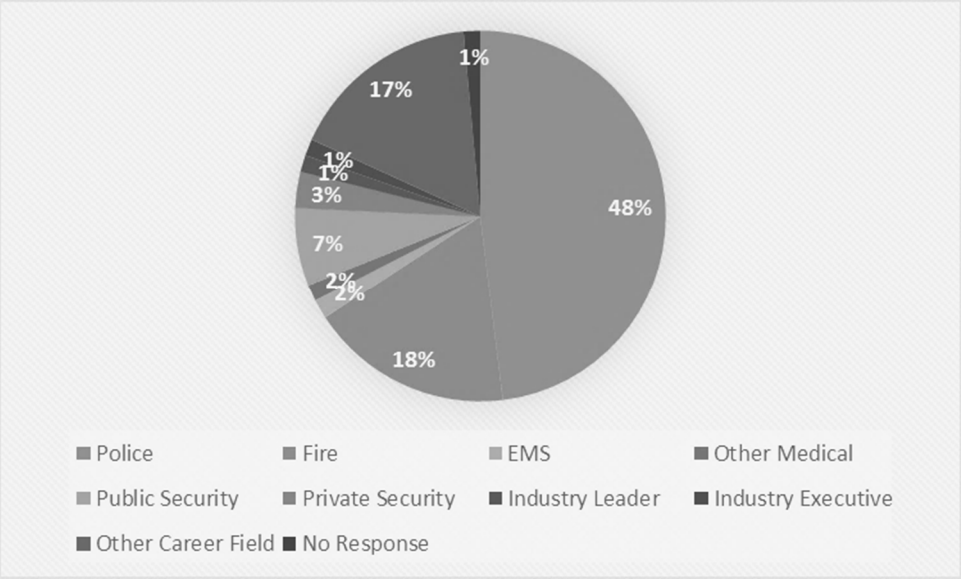

Figure 3. *Pie chart of participants by career field*

Results

In this next section, I will provide the results of this study. One of the greatest challenges in completing the statistical analysis of this study was the research design that I selected. While it is true the Solomon four group design is the most rigorous design it is also one of the most difficult designs to record the results because no one test can adequately capture the results to answer the research questions. In order to adequate capture my results I had to first conduct a ANCOVA so that I could account for the pretest as a covariate to determine whether or not pretest sensitization existed. Then I had to use a one-way ANOVA test to determine if there was a statistically significant difference between the groups that received the treatment and those which did not. Lastly, I had to conduct a paired t-test to determine the mean gain from the pretest to the posttest.

Beginning with the ANCOVA, I received the following results. The outcome of the variables was considered to be normally distributed and equal variance are assumed based upon the results of the Levene's test F (204) = .593, p = .442. The results comparing posttest scores accounting for the pretest were F (1, 205) = .387, p = .534, η_p^2 = .002, which represents that it was nonsignificant and no pretest sensitization exists see Table 7 and Figure 4. The next test I ran was the univariate ANOVA. For this test, the dependent variable was the posttest means of a pairwise comparison of the control group compared to that of the experimental group. There were 206 control participants (M = 74.33, SD = 12.12, 95% CI = 72.68, 75.98) and 206 experimental participants (M = 72.69, SD = 12.03, 95% CI = 71.04, 74.34) who were compared. The outcome of the variables was considered to be normally distributed and equal variance are assumed based upon the results of the Levene's test F (410) = .297, p = .586. The results of the ANOVA in determining if there was a statistically significant difference between the level of awareness between those who received lecture only and those who received both the lecture and the explosive demonstration and the results were F (1, 410) = 1.90, p = .169, η_p^2 = .005, which is nonsignificant and means that the null hypothesis failed to be rejected see Table 8 and Figure 5. The final test was the paired t-test which was used to determine if there was a significant gain in the score from the pretest to the posttest. The pretest (M = 59.96, SD = 13.29) compared to the posttest mean of (M = 74.13, SD = 12.04).

The test did demonstrate a significant correlation and there was a significant average difference between posttest and pretest scores t (205) =16.90, $p < 0.001$, d =

1.18, which is large effect see Table 9 and Figure 6. On average posttest scores were 14 points higher than pretest scores (95% *CI* [12.15, 15.82])

Table 7. *Results from ANCOVA (N=206) DV Posttest for both groups final study*

Source	Type III Sum of Squares	*df*	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	9104.408[a]	2	4552.204	44.841	.000	.306
Intercept	18703.399	1	18703.399	184.236	.000	.476
Pretest	9041.321	1	9041.321	89.061	.000	.305
Cntl_Exp	39.313	1	39.313	.387	.534	.002
Error	20608.310	203	101.519			
Total	1161620.000	206				
Total Corrected	29712.718	205				

a. R Squared = .306 (Adjusted R Squared = .300)

Table 8. *Results from univariate ANOVA (N=412) DV posttests for both groups final study*

Source	Type III Sum of Squares	*df*	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	277.291[a]	1	277.291	1.901	.169	.005
Intercept	2226315.039	1	2226315.039	1265.138	.000	.974
Cntl_Exp	277.291	1	277.291	1.901	.169	.005
Error	59795.670	410	145.843			
Total	2286388.000	412				
Total Corrected	60072.961	411				

R Squared = .005 (Adjusted R Squared = .002)

Table 9. *Results from Paired t-test (N=206) gain score from posttests final study*

	Pair Differences							
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	*t*	*df*	Sig.(Two-tailed)
Pair 1 posttest Score – pretest Score	14.2	12.0	.838	12.51	15.82	16.9	205	.000

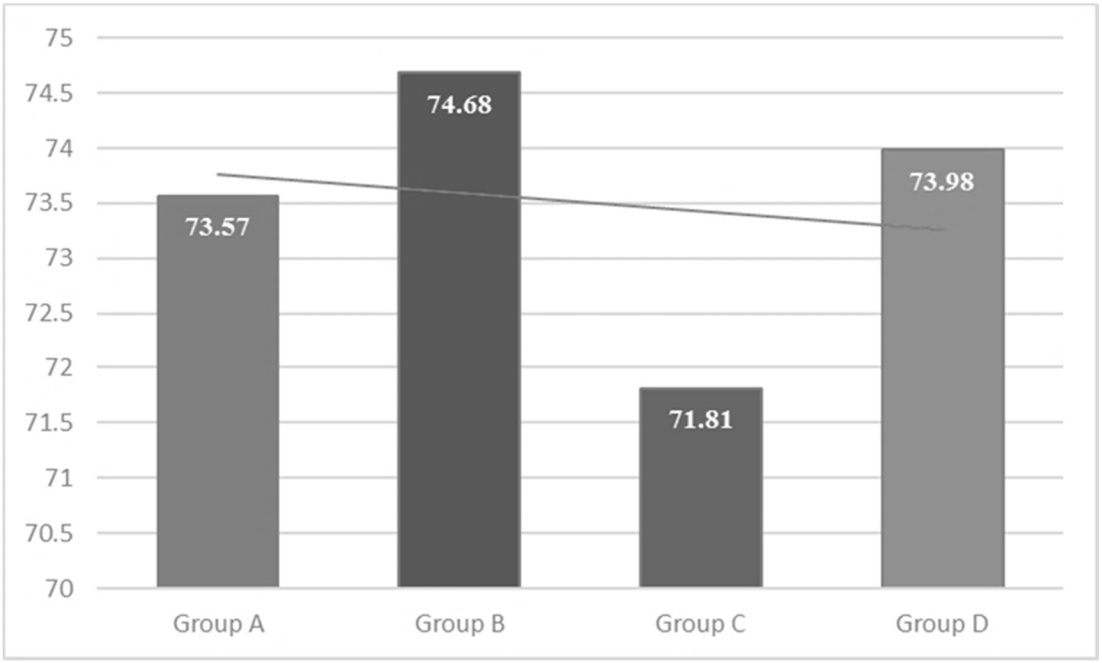

Figure 4. *Comparison of mean score between groups posttests scores demonstrating no pretest sensitization*

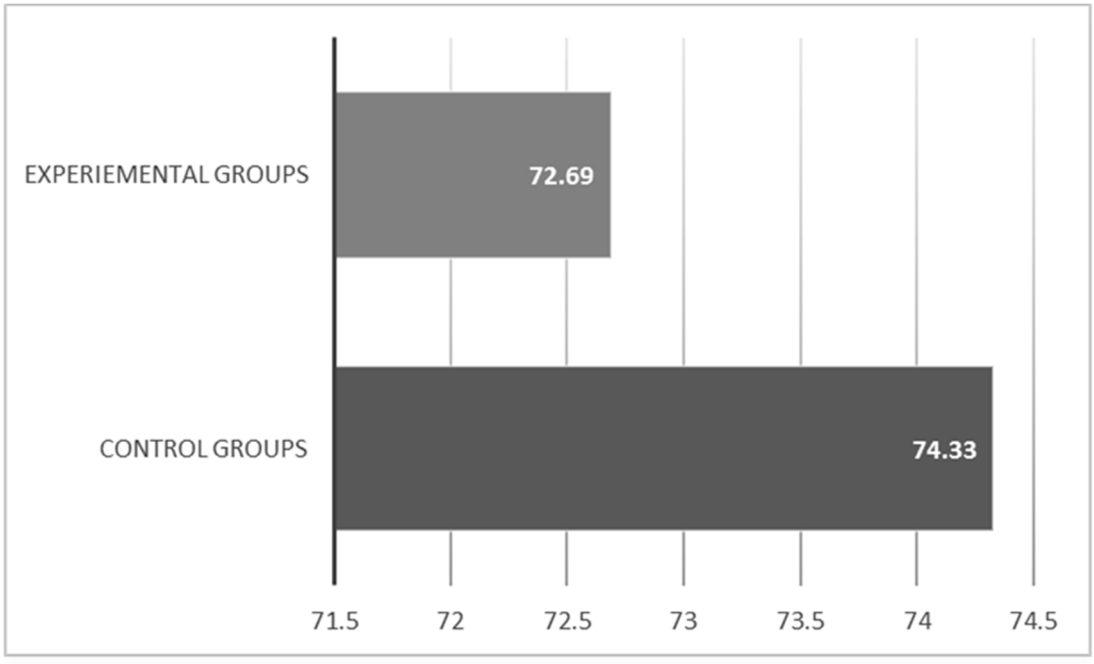

Figure 5. *Comparison of mean posttest scores between control and experimental groups demonstrating no statistically significant difference*

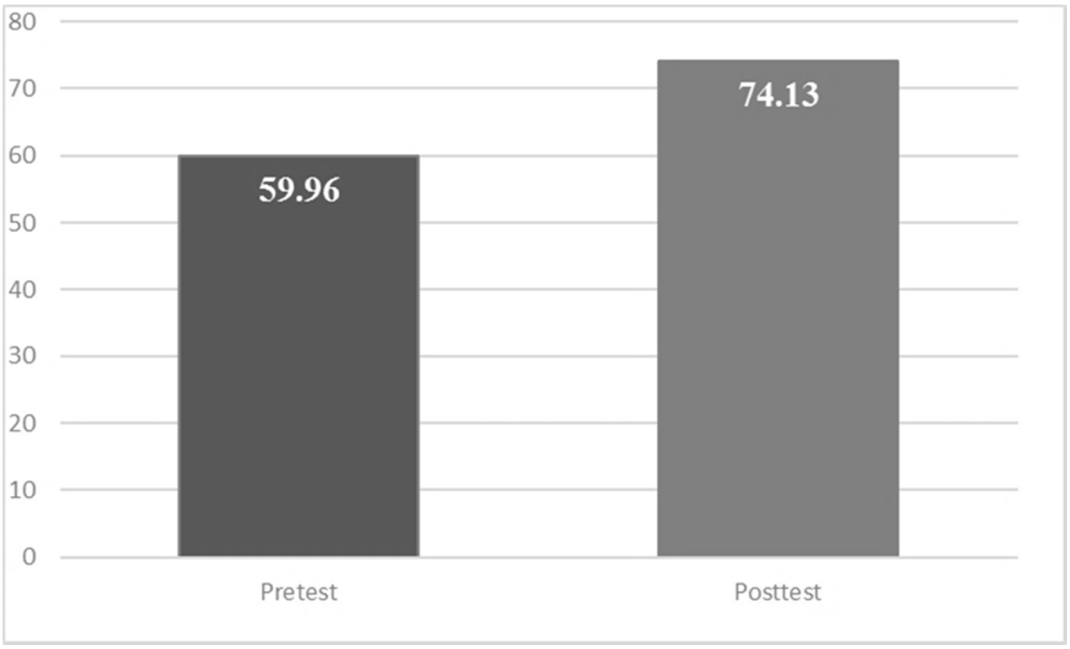

Figure 6. *Comparison of mean pretest to posttest gain scores*

Summary

As a result of the data analysis from this study it was discovered that my results failed to reject the null hypothesis that there is no statistically significant different in counterterrorism awareness of adult learners in the lecture only method compared to the lecture and demonstration method. I have to accept the null hypothesis because I was not able to prove that there is a statistically significant difference in counterterrorism awareness of adult learners between the lecture only and the lecture and demonstration approach. This result, of course, means that my first research question that questioned if a statistically significant difference in adult learning takes place between counterterrorism awareness training that is lecture based only compared to counterterrorism awareness training that involves both lecture and a demonstration was not proven as a result of this

study and the results were consistent with some previous non-counterterrorism studies (Adamson, 2012; Odom & Bell, 2015). While I was not able to reject the null hypothesis, I believe that there are reasons for not being able to do so in this study which I will discuss in Chapter 5. As for the second research question asking if there is a correlation between instructional methodologies used in counterterrorism training and the government's return on investment this too was not prove as a result of the study, but this is only partially true because the results did demonstrate that while the methodologies were not validated as being causal the results did demonstrate that the level of awareness did increase from the pretest to the posttest it just did not prove that the modalities were not significant but the government was gaining a return on their investment. This point will also be addressed in the next chapter.

Now that the research has been conducted and the results have been analyzed it is time to seek a greater understanding of what the results mean to public administrators. In the final chapter, we will interpret the findings of this study. We will then identify the limitations of this study. From there, we will provide recommendations for further research. Lastly, we will discuss the implications for social change as a result of this study and then bring this study to a point of closure.

Chapter 5- Recommendations, Social Change and Conclusions

Introduction

In this study, I set out to determine if there was a measurable difference of the level of awareness of first responders, public and private security personnel, and industry leaders who attend government-funded counterterrorism training initiatives that are lecture-based only compared to those training initiatives that offer both lecture and demonstration. The reason that this study was significant was that it provided public administrators with empirical data to support whether the training was effective and if either method offers the government the greater return on their investment. This research broke new ground by combining analyses of education, counterterrorism, and public administration.

While the findings of this study did not prove the theory that adults learn best when using two or more educational modalities, it still has significance to public administrators and demonstrated that, while the hypothesis was not proven, the participants did gain a greater level of awareness as a result of the training. This is a significant finding in itself. The study further demonstrated that counterterrorism programs (and for that matter all government programs) can and should be measured for effectiveness in compliance with the Administrative Procedure Act (APA). Since 1981, the APA has required federal agencies to provide empirical evidence that the programs are effective and conduct a BCA to demonstrate the return on investment (Cecot & Viscusi, 2015).

This chapter includes my interpretation of the findings, a discussion of the limitations of this study, my recommendations for future research, and concludes with my identification of the implications for social change.

Interpretation of the Findings

The motivation of the participants is as important as the results of this study. The results of this study indicated that the difference between those participants who were tested after receiving both the lecture and the explosive demonstration where statistically nonsignificant in relation to those who received lecture only. While it could be inferred that the explosive demonstration did not enhance the learning of the participants and the added expense of the demonstration is not the best return on investment of tax-payer funded training. I would like to entertain a couple of alternate assumptions.

My first assumption is that additional learning did take place but because the participants did not have any risk or reward to consider they did not apply themselves. I believe this because adults tend to have a higher level of extrinsic motivation when there is a risk or a reward as a consequence of learning (Bear, Slaughter, Mantz, & Farley-Ripple, 2017; Knowles, Holton III, & Swanson, 2012). This is not to say that the participants did not see intrinsic value in the training, on the contrary, I believe they did. However, I believe that they were either so excited at the opportunity to witness the explosions that they were not paying attention to the narration of the instructors, or that they were gaining additional learning but they hurried through the posttest so that they could leave.

Although neither belief can be proven, I think the truth may be a combination of the two. The reason that I say this is because very few people get to witness explosives being detonated, and people are so focused on not missing the explosive show that they tend to block-out everything else around them. I state this because I have participated in dozens of such demonstrations for close to two decades, and every time following the conclusion, people will ask me questions as to the type of explosives we detonated minutes after I or another bomb technician had just articulated was going to happen. I do not believe that people do this intentionally, but I do believe that they become so focused that they exclude everything else.

My second belief is that, due to lack of risk or reward regarding correct answers, many of the participants from the experimental groups did not take the posttest seriously. I hold that position for a couple of reasons. The first reason is that I observed several participants answering questions as quickly as possible, and when I graded tests the experimental groups were the only ones who I could see a drop-in score from the pretest to the posttest. I believe that, because there was not a consequence, and that it was the last thing standing in their way from going home, many participants did not apply themselves and hurriedly completed the test so they could leave. The second reason I believe this to be a possible explanation is that I consistently lost participants from the experimental groups who opted not to take the posttest and leave the venue at the completion of the demonstration. I think the scores would have been higher had the participants had something to risk, some sort of reward waiting, or another task that had to be completed before they retired from the day of training.

The second assumption is that the explosive demonstration was a valuable return on investment because, even if additional learning did not take place, the demonstration was the draw. If it were not for the opportunity to observe an explosive demonstration, I doubt that many of the participants would show up for this type of training. It would be a significantly harder draw to gather first responders, security or industry personnel (especially those in management) to take the time away from their regular schedule to sit in a classroom and learn about explosives without the benefit of seeing explosives in action. It is for this reason that I believe the explosive demonstration is an excellent return on investment because people did participate and is evident from the results that overall that participants did achieve a greater level of awareness as a result of the training. The results were not achieved from one modality to another as hypothesized but learning did take place.

Recommendations

I found this study to be a fascinating experience. Even though I was not able to prove my theory, the experience of this study did provide me with some insight for future research. My first recommendation would be to attempt to duplicate this study in some aspects on a smaller scale. My recommendation would be to try this study again but using a two-group study involving a control and experimental pretest and posttest groups instead of the Solomon four-group design. The reason for this is that it was proven that the tests were valid but did not lend themselves to pretest sensitization; therefore, there is no reason to add the additional difficultly of coordinating the S4G design. I further recommend replicating the study with one small change. Instead of dovetailing off of the established program, operate a similar, independent program using risk and reward

consequence (i.e. certificate awarding, class credit, etc.) based upon achieving a successful minimum passing score. I believe that if this element were added, the scores would be high both for the lecture only and the lecture and demonstration. I would further recommend that there be some additional function, whether it is an end of course evaluation, graduation ceremony, etc. that would prevent everyone from immediately leaving. Lastly, I would add a Likert scale or similar testing application to determine if the participants feel that they have a greater level of awareness as a result of the training. This would be an interesting aspect; I would like to see if the simple fact that participants believe they have gained additional knowledge makes them more aware and alert. If the participants are more aware and alert as a result of the training then the training does have value. Whether the participants remember the specifics of the course is of little consequence if this results in the participants being more aware of their surroundings. If the participants are more aware they may be more apt to reach out to local law enforcement or the FBI. If the participants are more vigilant then the mission of the NIEF/CIOW has been achieved and the training does provide a greater return on investment.

Implications of Social Change

The implications for social change as a result of this study are simple but important. The implication for social change is that this study has proven that counterterrorism training can be evaluated empirically for the effectiveness of the training. While I did not prove a difference in the level of awareness between one

educational modality and another, I was able to demonstrate that a greater level of awareness was achieved through the training.

From a public administration point of view, my study is significant because it demonstrates that programs can be measured for effectiveness. Also through this study, although it was supposed to serve solely as a "type", the FBI can use these results to verify that they are being good stewards of the tax-payers' money. The FBI could also choose this study as the starting point for further research that may improve the program or even result in the development of other outreach programs. Such programs will directly affect the safety of the United States against would be assailants because of the increased vigilance that is likely developed out of such training venues and if such valuable training saves even one life then it has more demonstrated that the benefits far outweigh the costs.

The second implication of social change is that this study has clearly demonstrated that, in accordance with the Administrative Procedure Act programs, counterterrorism programs can and should be measured for effectiveness. If programs prove to be effective, then they should be allowed to continue as a justified expenditure of public funds. If programs fail to be effective, then they should be either eliminated or redeveloped. Redeveloped programs should undergo additional evaluations, and if the change produces a productive program, then it should be continued. If the program is not productive, it should be eliminated. In 2017 every dollar must be spent wisely so it is prudent to trim the budget and eliminate those programs that contribute to fraud, waste, and abuse of funds and to promote those programs that produce the optimal results for those whom the programs are designated to benefit.

Conclusion

Since the events of 9/11, protecting the home front in the United States has been forever changed. No longer can the United States government idlily stand by and wait for the next attack to come. The United States government with the support of every citizen must be vigilant and take proactive measures to prepare those on the frontline in the defense of America from acts of terrorism. This must be met with a balance. In tough economy conditions, the United States government can ill-afford to un-necessarily allocate money at not just terrorism, but any public issue without having measurable criteria for success.

It is my sincere hope that my study will inspire public administrators to avoid simply funding programs or maintaining programs without first establishing a means to verify that programs are preforming as designed. Financial stewardship in public administration must become a priority.

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Appendix A: Sample Recruitment Letter

This letter is to welcome you the upcoming National Improvised Explosives Familiarization (NIEF)/Critical Industry Outreach Workshop (CIOW) scheduled for (Date) at (location). Your local FBI WMD Coordinator (Name) who originally contacted you or your agency because you meet the criteria of being either a first responder, serve in private or public security, or you are in some leadership position within industry. SA (Name) is forwarding this correspondence on my behalf.

For introductory purposes, my name is Ira D. Jones, Jr., I am a doctoral candidate at Walden University and as part of my degree requirements I am comparing instructional methodologies in counterterrorism training to determine if there is a measurable difference. If a difference exists in the level of awareness in participants in one method over another then government agencies can better assess how to use tax-payer funds wisely.

What I'm asking of you is to consider being a participant in my study. Your participation would be a minimal inconvenience of your time. Upon your arrival at the training you will be asked to participate and you will be asked to read a form called an "Informed Consent" that will explain your participation. If you agree to participate you will be asked to draw a card from a bowl and you will be assigned to the group indicated on the card. Depending upon which group you are assigned you may be asked to take a pre-course assessment to provide me with the average level of awareness concerning the subject matter before instruction. The assessment will consist of 25 multiple choice questions and should take no more than 15 minutes of your time.

Everyone will then attend the classroom portion of the training. At the conclusion of the lecture portion you may be asked to take a post-course assessment before observing the explosive

demonstration. If you are not asked to take a post-assessment at that time you will be asked to take a post-assessment immediately following the explosive demonstration. The post-assessment is also a 25-question assessment that will not take you more than 15 minutes to complete.

Please note that your participation is strictly voluntary and you may end your participation at any point in the process. It should also be noted that regardless of your decision you will still be allowed to attend that days training because this study is not designed to exclude anyone from the opportunity to gain knowledge. I do ask that if you happen to be a current or former military Explosive Ordnance Disposal (EOD) technician or a Public Safety Bomb Technician (PSBT) that you please identify yourself and you will be placed in a non-assessment group but you will still be allowed to attend the training. I look forward to meeting you in person and I ask that you please thoughtfully consider participating in my study. Thank you in advance.

Respectfully,

Ira D. Jones, Jr.